THE

ELECTRICAL REVIEW.

VOL. LXIII. AUGUST 14, 1908. No. 1,603.

ELECTRICAL REVIEW.

Vol. LXIII.] CONTENTS: August 14, 1908. [No. 1,603.

	Page
The Registration of Wiremen	241
Mile End and the Moral	242
The Lowest Tender	243
Engineering Exhibits at the Franco-British Exhibition (*illus.*)	244
The Jubilee of the Atlantic Cable (*illus*)	246
Localising High-Resistance Breaks in Cables (*illus.*) (*concluded*)	247
Private Bills in the Past Session	250
Correspondence:—	
Live Steam Feed-Water Heating	251
A Service Problem	251
Electrical League	251
The Electrical Industry.—What is Wrong?	252
Tangled Topics	253
Business Notes	254
Notes	260
City Notes	264
Electric Tramway and Railway Traffic Returns	268
Stocks and Shares	268
Share List of Electrical Companies	269
Travelling	271
Commercial Notes	271
The Difficulties of Co-operation between Manufacturers and Contractors	272
International Electrotechnical Commission (*continued*) ...	273
Proceedings of Institutions:—	
The Generation and Transmission of Power for Main Marine Propulsion and Speed Regulation	274
Energy Losses between High-Voltage Conductors ...	275
Legal	275
The Colliery Exhibition (*illus.*) (*concluded*)	276
Electrical Accidents in 1907	278
New Patents Applied For, 1908	280
Published Specifications	280

THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 933 Central 4425 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 18s. 6d., Canada, £1 1s. 8d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

READING CASES, to hold from One to Twenty-six Numbers until the volume is complete for Binding, can be had from the Publishers, Price 6s., or Free by Post (in Great Britain), 6s. 6d.

FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London), to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1908 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

THE REGISTRATION OF WIREMEN.

FOR some time past the need for some form of licensing or registration of wiremen has been felt among the general body of electrical contractors. At present anyone can call himself a wireman, just as, at the other end of the scale, any ignoramus may add the mystic letters C.E. to his name, and style himself a civil engineer or a consulting engineer. In parenthesis, it may be mentioned that the letters C.E. really stand for a Glasgow University degree "Certificate in Engineering," and it is a case of trading under false pretences for anyone to adopt these letters who has no claim to the distinction. Almost equally reprehensible is it for any unqualified person to pose as an electrical engineer, electrical contractor, or electrical wireman. It is a duty which the electrical profession owes to itself to see that, so far as it is possible to prevent it, the electrical industry, in any of its various branches, shall not be brought into disrepute either by the charlatan posing as that for which he has no qualification, or by the well-meaning but inexperienced workman undertaking work for which he is incompetent.

The set-back to the industry which might result from a serious fire definitely traced to defective electrical work, has only to be appreciated to make one realise the importance of eliminating by all legitimate means the wastrel workman, the "gripsack" contractor—to borrow an Americanism—or the unqualified and incompetent electrical engineer from the ranks.

A step in the right direction, and one which we heartily welcome, is being taken by the Electrical Contractors' Association, having for its object the registration and classification of workmen engaged in electrical wiring and erecting. The licensing of wiremen and contractors is in vogue in some of the States of America and in New Zealand. There, a licence, for which a fee is charged, is granted to persons who have satisfied the local authorities as to their integrity and competence to undertake electrical work. The licence is for a definite period, and must be renewed annually. The necessity for periodical renewal of the licence is a feature which has much to recommend it, because there are other qualifications than mere technical ability and skill to be taken into consideration in deciding as to who is or is not a fit and proper person to be licensed.

We are pleased to note, therefore, that the Electrical Contractors' Association has not overlooked this point. So far as we understand its proposals, as outlined in the columns of the *Electrical Contractor* for August, they are that a register of competent men is to be kept at the office of the Association; a man who wishes to be registered is required to fill in a registration form which contains a number of questions bearing upon the nature and extent of the experience which the applicant has had; and the names of three firms for whom he has worked are to be given. This form, when filled in, contains a word picture of the man as he appears to himself,

and is, therefore, incomplete. In order to complete the record, forms are also sent to the employers named, who express their opinions on the character and ability of the workman in the form of answers to definite questions, somewhat similar to those on the form filled in by the man; this gives a view of the man as he appears to his employer. The composite effect of the two, as it presents itself to a third party, will form a fairly accurate portrait of the man as he really is. When a man has been employed by a contractor on the strength of his registration character, it is desired that the secretary of the Association shall be notified when the man is discharged; and that the contractor shall state if the man turned out all that he was represented to be. In this way the record as to the character and capabilities of the individual workman can be kept up to date, which, as we have already indicated, is a most important matter.

It is not proposed that any charge for registration shall, for the present, be made either to the workmen registering, or to the contractors who avail themselves of the Registration Bureau. It may, however, be found that as the work of the Bureau increases, some small charge may become imperative in order to meet expenses. It is intended to classify the men under different headings, such as "charge hands," men qualified to do "casing work," "conduit work," "motor work," &c., so that if a contractor telephones the Bureau for a man suitable for any particular class of work there will be no difficulty in quickly accommodating him.

It is intended also, as will, of course, be necessary if the system is to be of service, to divide the men into two broad classes of employed and unemployed. This will necessitate transferring the names from one class to the other with more or less frequency depending upon the migratory character of the individuals. In practice this will, no doubt, prove itself to be the weak point of the system. It will be essential, if the records are to be of practical value, for someone, either the man himself or the employer, to notify the Bureau of the discharge of every man whose name is on the register. If the contractor or employer undertakes this, and the man immediately finds employment with another firm, his name will probably figure on the unemployed list, although he is actually in daily work. On the other hand, if it is left to the men to notify the Bureau, the chances are strongly in favour of their notifying only in case of discharge and omitting to do so if they find fresh employment without any assistance from the Bureau. A card system will, no doubt, be adopted, each man being represented by a card containing his record. By means of such a system it will be possible to see at a glance how many men are available in each of the classified divisions. But, obviously, everything depends upon the Bureau being kept accurately informed of the men's movements. Already 400 men have sent in their names and addresses to the secretary, Mr. Leonard Tate, who will be glad to receive the names of all who desire to be put on the register.

It is not quite clear to us how the Bureau will be able to differentiate between members of the Electrical Contractors' Association and contractors who are outside the pale. According to the announcement in the *Electrical Contractor*, the Bureau has been started "for the supply of men to the members of the Association," and we note that at a recent meeting of the E.C.A. it was decided that outside contractors were to be debarred from benefiting by the scheme. Now a large number of the men who desire to be placed on the register may never have worked for a member of the E.C.A., although they are good men and have worked for reputable non-Association firms, to whom the Bureau will look for information, and to whom the "private and confidential" form will be sent. Is it to be expected that such non-Association firms will gratuitously give information about their men solely for the benefit of Association firms? They will, it seems to us, have a right to expect reciprocal treatment. However, we have no doubt that this aspect of the matter has been well considered, and that some means can be devised to give preferential treatment to Association members, whilst not excluding other contractors from the benefits of the scheme.

Another point which arises out of the foregoing is as to the value which can be attached to the opinions and recommendations of contracting firms who are non-members of the E.C.A., and who are unknown to the secretary. Suppose, for instance, that the firms cited as references on an applicant's form are not electrical contractors at all in the true sense of the term, but are builders, decorators, ironmongers, plumbers, and the like, who add small wiring work as a side line to their legitimate business. The man's opinion of his late employer's qualifications and methods might be of more value than the employer's verdict on the man, for it is well known that such firms are entirely in the hands of their men, so far as the conduct of the electrical branch of their business is concerned.

Out of this subsidiary consideration arises the further question as to whether or not it is just as necessary to register the contractor and tabulate his qualifications, as it is to register the workman. As mentioned earlier in this article, such a system of registration and licensing is in vogue in certain of the United States, and it has much to recommend it. That opinion upon the subject is not unanimous is evidenced by the reception accorded to the Birmingham Corporation's register of wiring contractors who are authorised to carry out installations in that City. Mr. Talbot, in his presidential address to the I.M.E.A., considered that the Corporation would be acting *ultra vires* in seeking to authorise or prevent a contractor carrying out an electrical contract. He was of opinion that the E.C.A. or some similar body should undertake the scheme of registration.

On the other hand, the Central Board of the E.C.A. have officially approved the action of the Birmingham authorities, and authorised their secretary to write the engineer to that effect; whilst the *Electrical Contractor*, the official organ of the E.C.A., considers the Birmingham scheme "not only undesirable, but useless," modestly refraining from naming "the only association capable of formulating a registration scheme and making it successful in application." For the present we leave the matter there as food for thought during the holidays.

MILE END AND THE MORAL.

The proceedings which were terminated at the Old Bailey on Friday last week conclude another stage in the process of cleansing the Augean stable of our public life from corruption. It may have been with something of a shock that we witnessed the rising of the curtain, though it ought not to have been, in view of the persistent rumours that had been in the air for years, but it must have been with a sigh of satisfaction that most of us heard the conclusion of the sorry Mile End Tale. All interested in the purity of local government will welcome the laying-on of the strong hand

upon those who, under the guise of Guardians of the Poor —an office in which they should stand upon a pedestal for unimpeachable morality and worthiness of public trust— had fattened on the misuse and juggling of public moneys. Of the penalties that have been meted out we must say that, in our view, none of them is too heavy—it was imperative that they should be severe, both in the interests of justice and for the protection of ourselves as ratepaying public from being fleeced by those upon whom we have conferred the honour of local government. That it is due to the apathy of the voter at election times that such men are elected does not excuse the offenders who betray their trust.

Everything that will tend to extirpate the tendency to subordinate public interests to personal enrichment and aggrandisement ought to be encouraged, for it is a tendency that has taken far too great a hold. Who has not met builders and others who have possessed no marked ability for performing the duties of a councillor, &c., but who "put up" because, speaking in a business sense, they consider it would be "a good thing?" And they make no secret of it in conversing with their friends. We know of one who followed a sartorial calling who said that he did not exactly know why, but when he was on the Council his business went so much better than when he was not. He sold far more suits and costumes wherewith to clothe Adam's sons and Eve's daughters, and was thus fully compensated for the time devoted to his public duties.

We ought to feel grateful to Mr. John Burns and the L.G.B. for the fierce light that they have caused to be shed upon some public offices, exposing wrongdoers and their wrongdoing in theft and in extravagance. We do not want to regard the sentences imposed in a vindictive spirit, but we would rather forget the "quality of mercy" and its attributes with such a subject in our mind.

We should be sorry to think that rottenness of such a kind as this were general, but in our position as editors rumours manifold have reached our ears during the last decade or two—the period of municipal electrical development. Some of these may have been mere hearsay, possessing no foundation in fact; some may have had a modicum of truth, and have gathered a legendary growth by the time they reached us; others have lacked that evidential support that was necessary to justify their publication; so, of course, many things have not got into print that would form a useful commentary upon the offences recently brought to light. Sometimes these rumours have related to municipal contracts for which the public would have paid many hundreds of pounds less than they did had not reward to go to this or that gentleman. Sometimes they have concerned councillors who have shown affectionate regard for candidates for positions as borough electrical engineers before applications were supposed to have been opened, offering the full weight of their influence when the settlement of the appointment came up. Sometimes an engineer's salary is said to be only a portion of his "makings"—a word which means something more than fees for private consulting work done "out of hours."

While such things obtain, it is not difficult to comprehend the grievance of some men that it is necessary to "know the ropes," and "do as Rome does," if you want to secure business—everybody else adopts certain practices, we must do the same! Mr. John Burns went to the presidency of the L.G.B. with a full knowledge of municipal life, and the weaknesses of some councillors and guardians, and he apparently knew that the time was ripe for inquiry and revelation. In the ordinary course of things too much stirring up of the mud is not desirable, for we all must feel discredited by what our representatives do, and the effect may take a long time to wear off. But the revelations are inevitable if we are to get back to right ways, and these inquiries have been amply justified by the results so far. We trust that the fact that there is available, and will be used, machinery for bringing to the bar of justice those who are found to be delinquents in the public service, will have a deterrent effect. Fear of the law and of its penalties, however, is not a very lofty consideration to keep guardians, councillors, and others to the paths of rectitude in the matter of contracts and appointments. There ought to be something higher than that impelling to strict morality in the public service. We hope that that may be promoted by the election of men who have no private ends—trade or otherwise—to serve, men who will be willing to sacrifice themselves in the interests of the community. Unless we have this we shall be perpetually exposing ourselves to the possibilities of what the American calls "graft."

The Lowest Tender.

No small prejudice against the Mile End Guardians was created by the fact that in many cases tenders had been accepted which were not the lowest in price.

Probably contracts for work of the description dealt with by the Guardians should, in the interests of the ratepayers, have been allotted on the basis of the lowest tender. But what can be called a good bargain in dealing with contracts of this description does not necessarily indicate a good bargain in the case of tenders for work of a more special nature and during the execution of which considerable skill is required.

Probably one of the greatest disadvantages of the municipalisation of our electricity undertakings in this country—disadvantages from both an engineering and a business point of view—is the fact that so often the lowest tender has to be accepted regardless of other considerations. We say advisedly *has to be accepted* due to the circumstances under which our public contracts are let, and due to the suspicion that may be cast on the engineer by members of a Committee if this practice is departed from.

Price is too often looked upon as the sole consideration. On the Continent, on the other hand, there does not exist the same tendency to accept the offer which on paper appears to be the most favourable.

Without question, some of the older engineers have the strength of their convictions, and consider it in the interests of their employers to recommend what they regard as the most advantageous to their undertakings; but this state of affairs is rather the exception than the rule, and the tendency seems to exist—and this has been much emphasised since the carrying-out of extensions has been left to engineers employed by Corporations, as distinct from consulting engineers acting only temporarily for the Corporation—to avoid difficulties by recommending the tender offered at the lowest price.

That the lowest tender is not necessarily the cheapest—in fact, is seldom the cheapest in the heavier branches of engineering—is exemplified in the power stations of many of our towns, where an abnormally large amount of stand-by plant is often carried to compensate for want of reliability.

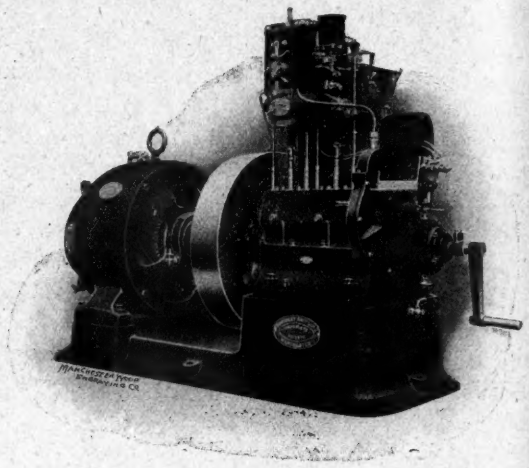
It would be a matter for regret if engineers in advising their corporations should invariably feel it necessary to recommend the acceptance of the lowest tender, in spite of their better judgment to the contrary.

ENGINEERING EXHIBITS AT THE FRANCO-BRITISH EXHIBITION.

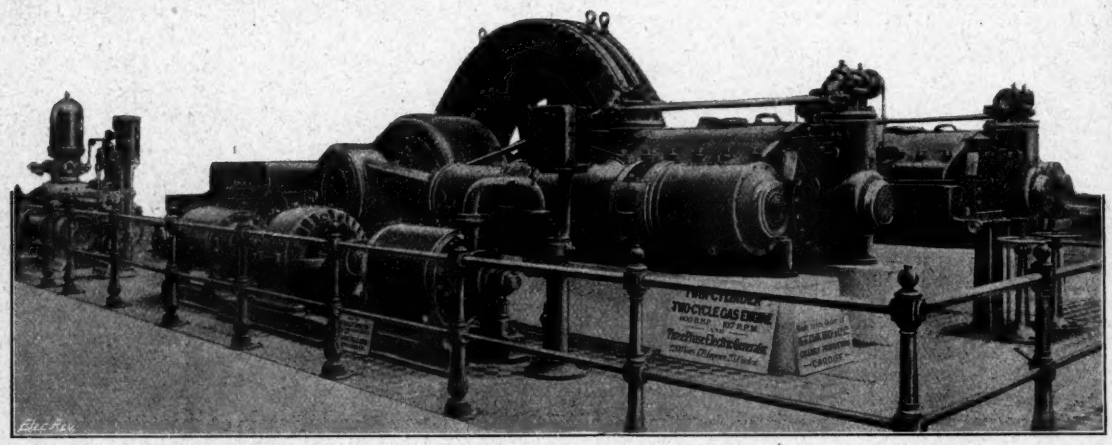
The Machinery Hall of the Franco-British Exhibition contains much that will interest the general engineering visitor, not that there is anything particularly novel to be seen, but merely because the various items of machinery, &c., representing such a wide range of industry, are collected and presented in a convenient manner. As might be expected, only a comparatively small—though important—section of these exhibits is of direct interest to the electrical engineer, to whom the following notes may appeal :—

Mather & Platt, Ltd.—This firm's stand is one of the most prominent in the Machinery Hall, and contains among other exhibits a fine horizontal twin-cylinder Korting type gas engine with a three-phase generator mounted on the crankshaft between the cylinders. The plant will develop 800 B.H.P. output continuously with a gas supply of about 140 B.TH.U. per cb. ft. (or approximately 314 lb. coal per H.P.-hour).

The alternator is of the fly-wheel type designed to give 170 amperes at 2,200 volts, 25 cycles, with a ·8 power factor. This plant follows much on the lines of steam engine design; unfortunately its position and demands in the shape of gas did not allow of it being shown in operation.



Crossley High-Speed Gas Engine Set.



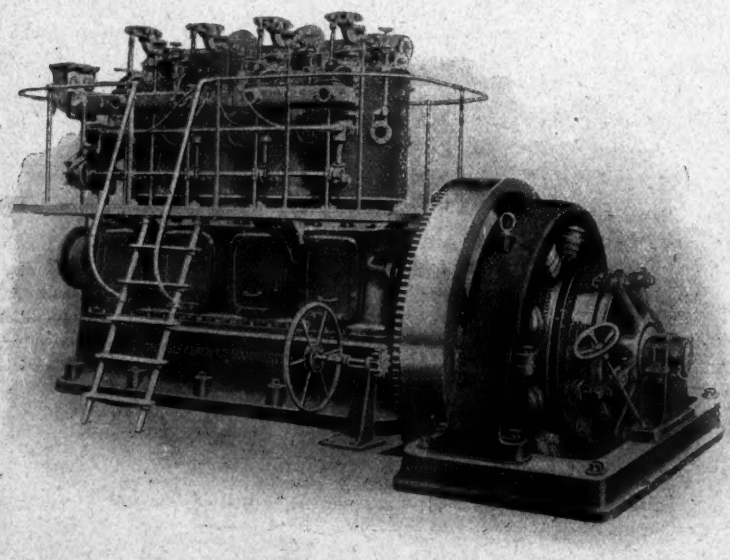
View of Messrs. Mather & Platt's Exhibits.

Other exhibits are a 210-B.H.P. Zoelly steam turbine coupled to a high-lift turbine pump—the latter for operating against a head of 400 ft.; a pair of high-lift turbine pumps, coupled in series, and driven by a 150-H.P. direct-current motor, this combination being capable of delivering against as much as 2,000 ft. head; also various fire pumps, &c.

Crossley Brothers, Ltd.—This stand which adjoins that last mentioned, contains examples of the well-known Crossley type of gas engine, suitable for electric driving. Prominent among them is a four-crank vertical engine direct-coupled to a 140-KW. 220-volt G.E.C. dynamo, which is operating in connection with a Crossley suction plant using anthracite as fuel.

Starting is effected by means of compressed air, receivers charged by a small engine-driven compressor, being provided. The engine is provided with forced lubrication, and can operate alternatively on town's gas; the change in gas can be made while the engine is running. A 5½-B.H.P. vertical high-speed gas engine, coupled to a dynamo and running at 700 B.P.M., is also on view. The weight of the complete set is 12½ cwt.

A two-cylinder marine motor, a 40-H.P. motor car engine and two horizontal type oil engines are also shown.



Four-Cylinder Crossley Gas Engine and G.E.C. Generator.

The British Westinghouse Electric & Manufacturing Co., Ltd.—This company's gas engines figure largely in various buildings, as mentioned in our last article on the Exhibition. The most important Westinghouse engine exhibit is the 750 B.H.P. three-crank six-cylinder vertical gas engine which, coupled to a 500-KW. direct-current generator, can be seen running at one end of the Machinery Hall. This machine is run in parallel with a Parsons turbo-generator, and supplies energy for lighting and power purposes in the buildings. The feature of the engine is the arrangement of tandem cylinders to each crank. This type of engine is provided with forced lubrication high-tension ignition, and is started on compressed air; it operates on producer gas supplied from a Mond plant outside the building.

For supplying the lighting and power in the Australian and Canadian sections, similar but smaller gas-engine-driven sets are installed, operating on town's gas.

As might be expected, Westinghouse motors are largely employed for operating machinery, such as the machine

tools at the stands of Messrs. Hetherington, and Selig, Sonnenthal and Co., and printing machines for Messrs. Bemrose.

The Westminster Engineering Co., Ltd.—This company occupies one of the stalls in the Supply Companies' Pavilion, and devotes its exhibit principally to arc lighting matters. Of the latter the photographic lamps are the most prominent, one specialty being a large lamp burning singly on a 500-volt direct-current circuit. The arc is some 6 in. long, and the actinic power of the light very high. Two similar lamps were used by the *Daily Mail* on the occasion of the visit of the French President and King Edward to the Exhibition. Another item of interest to the supply engineer is a new pattern limit switch, designed for use in blocks of flats or offices, where each tenant can be charged a fixed amount per annum for his lighting up to a specified maximum amount. If the maximum is exceeded the switch operates, by alternately opening and closing the circuit, and limiting the current to the specified value. This switch is shunted by a resistance, so that the breaking of the circuit leaves the lamps burning dimly.

The company claims that this is the only limit switch suitable for metallic-filament lamp circuits, as owing to the large starting current of this type of lamp, if the current were entirely broken and the lamps extinguished, the switch would continue to work (with the starting current) until nearly all the lamps were switched off.

A number of photos on view give some idea of the range of electrical apparatus turned out by this firm.

C. A. Parsons & Co.—This firm has on view, and running, an 1,800 KW. turbo-generator set, in which the two 460/560-volt D.C. generators are in tandem. The plant is of the latest type, similar to that used in the Marylebone and Manchester (Dickinson Street) stations, and is too well known to need further reference here.

Davis & Timmins, Ltd.—Screws, nuts, bolts, washers, terminals, &c., for almost any purpose and in almost any quantity, accurately describes this well-known firm's specialties, a selection of which is on view in the Machinery Hall.

Electromotors, Ltd.—To enumerate this firm's motor exhibits would entail a lengthy reference to a large section of the exhibition, as they are to be found in a dozen different directions.

One of the side stands of the Supply Companies' pavilion, which forms the firm's headquarters at the Exhibition, contains motors applied to hoist, pump and fan driving, also for horse clipping and operating portable drills, &c. Those who prefer to see the company's motors operating under practical conditions cannot do better than visit the *Daily Mail* Pavilion or the tobacco manufacturing plant exhibited by Messrs. Godfrey Phillips & Sons.

Le Carbone are showing a fine collection of carbon brushes, contacts, microphone disks, shot and powder, welding carbons, primary cells of various types, and their patented connection for brushes fitted with pigtails. The range of carbon brushes, for high and low speed, and tramway work will particularly interest the engineer.

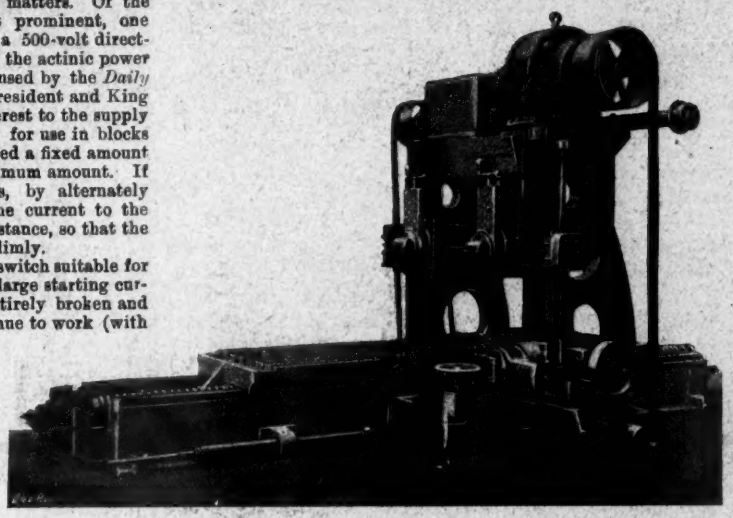
The Power Gas Corporation, Ltd.—This firm supplied the 2,000-H.P. Mond gas plant referred to earlier. The plant includes two Mond producers, a patent mechanical washer, a gas cooling tower, two centrifugal cleaners, two scrubbers and a governor. The fuel is fed into bunkers over the producers by means of an

Mond Gas Plant at the Franco-British Exhibition.

elevator; it then gravitates through charging hoppers into the producers. The producer is continuous in operation, and the blast is supplied by a Roots's blower.

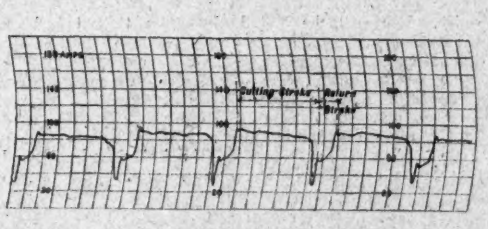
The special features and operation of this type of plant have been frequently described in our pages, one great advantage is its adaptability to very cheap fuel.

Joshua Buckton & Co., Ltd.—Messrs. Buckton's stand contain two most interesting exhibits—the one an electrically-driven regenerative spring-balanced planing machine and the other a 30-ton testing machine, also electrically driven. The principle under-



Buckton's Patent Spring-balanced Planing Machine, with Motor Drive.

lying the design of the planing machine is that of balancing the forces by recoil springs. At the reversal the springs absorb the energy of the moving parts, and return it during the period of acceleration, thus constituting a complete regenerative system.



Load Curve of the Buckton Planing Machine.

These springs produce beneficial results other than the large saving of power that they effect. Much time is saved by the promptitude with which the machine reverses and attains its full speed. The reversal is extremely accurate; although the machine may be cutting at 60 ft. and returning at 180 ft., not more than $\frac{1}{8}$ in. clearance is required between the tool and any projection above the surface being planed. This accuracy is attained without having regard to modification either of stroke or cut.

The stroke may be adjusted while the machine is running without disturbing the synchronism of the belt-striking motion with the spring compression; the return stroke speed is constant, and the cutting speed can be varied from 20 ft. to 180 ft. per min.

The machine is fitted with a special power feed and traverse mechanism; it runs remarkably easily, as shown by the load curve when taking heavy cuts on a 4-ton steel ingot, the diagram being obtained from a Kelvin and White recording ammeter. The driving motor is of 20 H.P., of the interpole type, and was supplied by Messrs. Laurence, Scott & Co., while Messrs. Bray, Markham, Reiss supplied the starting and controlling switchgear.

The testing machine is also of more than usual interest, as it incorporates a patent autographic stress and strain recording apparatus, shown for the first time. A 5-H.P. Laurence, Scott interpole shunt motor, designed for variable speed work, is provided with this machine.

Messrs. W. H. Allen, Son & Co., Ltd., have a comprehensive display of the various types of machinery turned out by their Bedford works, including examples of their well-known vertical high-speed engines, Allen-Edwards three-throw air pumps, turbine pumps, &c. An interesting feature is a 5-B.H.P. two-crank paraffin engine, direct coupled to a dynamo, which class of plant Messrs. Allen have recently commenced to manufacture. The engine is fitted with low-tension magneto ignition; at starting the vaporiser is heated by a small hand lamp, but subsequently its temperature is maintained by the heat of the exhaust. The governor, which controls a balanced throttle

valve, adjacent to the inlet valve, is placed in the enclosed crank chamber, the latter being arranged for splash lubrication. Needless to add, the electrical apparatus on the stand is of the firm's own make.

Rashleigh, Phipps & Co.—The model house, forming part of the Co-operative Electrical Exhibit, and its kitchen in particular, have given Messrs. Rashleigh, Phipps an excellent opportunity of showing the manifold uses of electricity in the home, other than for lighting.

The electrical kitchen, replete with its cooking table (replacing the usual kitchen range), oven, hot plates, grill, toaster, boiler, &c., is very much in evidence, frequent demonstrations of cooking being

Electrical Kitchen Appliances at the Model House.

given daily. It should be noted, however, that the kitchen apparatus is much in excess of that required for the model house, being capable of cooking for 30 persons. The cooking table consists of a number of circuits, each controlled by two switches, giving three degrees of heat, pilot lamps being arranged to show which circuits are in use. A main switch, cut-outs, fuses, &c., and an ammeter, find a place behind the table.

The oven is of special construction (the first of its kind), and is claimed to be an exceedingly efficient piece of apparatus. The

The Cooking Table, with Control Switches Behind.

kitchen is ventilated by a small Blackman fan, and is also provided with a hot cupboard for warming dishes, &c., and an electrical ironing outfit.

Domestic heating utensils, ranging from the ordinary radiator to the cigar lighter, are provided throughout the house, which loses none of its attractiveness from their presence.

Messrs. Babcock & Wilcox, Ltd.—The whole of the steam generating plant for supplying the Parsons turbine was supplied by Messrs. Babcock & Wilcox. This includes three of their well-known water-tube boilers, each rated at 10,000 lb. steam per hour, at 160 lb. pressure and superheated some 100 to 120° F. The boilers are fitted with the standard type of internal superheater and chain-grate stokers, the latter being driven by a Reader engine. The boilers are provided with a short iron chimney and an induced draught plant—the latter supplied by Messrs. Musgrave, of Belfast, and including two "Ulster" fans coupled respectively to a Lancs. D. and M. Co.'s motor and small tandem compound steam engine.

Two Hall feed-pumps, a Lassen & Hjort automatic water softener, and a Kent water-meter, are provided in connection with the boilers.

Inside the Machinery Hall, Messrs. Babcock & Wilcox have further interesting exhibits, including a Marine type boiler, a coal conveyor, and various models and photographs.

(To be continued.)

THE JUBILEE OF THE ATLANTIC CABLE.

As we pointed out in our last issue, the jubilee of the Atlantic Cable took place on Wednesday last week—so far as its successful laying and landing at both ends was concerned; its formal inauguration by Queen Victoria and the President of the United States, however, took place on August 16th. As an appropriate commemoration of an event which must for ever be regarded as of supreme interest and importance to the human race, above all to the English-speaking nations, we reproduce herewith on a reduced scale pages 242 and 243 (March 14th, 1857) and 532 (May 29th, 1858) of the *Illustrated London News*, showing processes in the manufacture of the first Atlantic cable at the works of the Gutta-Percha Co.; part of the completed cable at Messrs. Glass, Elliot & Co.'s works; and the cable in course of reshipment on board H.M.S. *Agamemnon* and the U.S.S. *Niagara* in Keyham Harbour.

Previous submarine cables had been laid only in comparatively shallow waters and over short distances; the new venture constituted a plunge into the unknown. Depths of miles, on a sea-bed but inefficiently surveyed, were to be encountered, and the length of cable—some 2,500 nautical miles—was not unreasonably regarded as gigantic. The projectors themselves were thought of as little better than lunatics by many who prided themselves on the possession of common-sense. Nevertheless, they pressed on with sublime courage, and though at first their efforts met with disaster, they carried their project to fruition in the teeth of all obstacles.

The construction of the cable was remarkably similar to that adopted for the most modern cables; the core consisted of 7 strands No. 22 B.W.G. covered with three layers of pure gutta-percha, and one of tarred hemp, and was protected with iron wires, the deep-sea portion weighing in air about 1 ton per mile, and the shore ends being much heavier. The construction of the cable, as well as the arrangements for laying it, was in the hands of Mr. C. T. Bright, afterwards Sir Charles Tilston Bright, the engineer to the Atlantic Cable Co.; Mr. Whitehouse was the electrician. The contract for sheathing was divided between Messrs. Glass, Elliot & Co., of Greenwich, and Messrs. R. S. Newall & Co., of Birkenhead, who, it may be noted, were originally pit-rope makers, and therefore versed in the manufacture of subterranean, if not submarine, cables—of a sort. The first cable cost some £225,000, a large sum to risk in so speculative an enterprise.

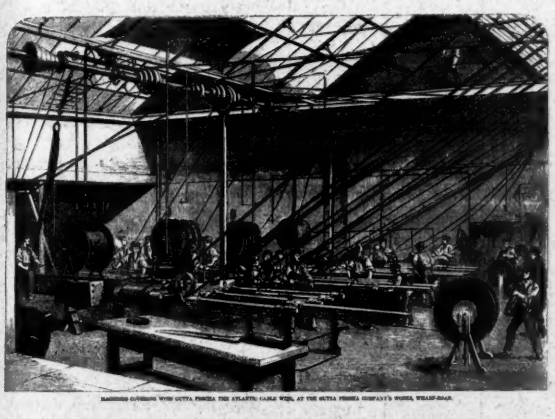
The British and United States Governments supported the undertaking by lending ships to lay the cable, of the combined sailing and steam-propelled type then ruling. These took on board the cable in the Thames and Mersey respectively, and met at Queenstown on July 30th, 1857. The cable was there tested for continuity, and the vessels proceeded to Valentia, where the shore end was landed on August 5th. The *Niagara* commenced paying out on the following day, and all went well until the 11th, when the cable parted, 380 miles having been laid; the depth at this point was 2,000 fathoms. Unfortunately, there was not sufficient cable remaining to renew the attempt, and the season was too far advanced to permit of an additional length being manufactured that year. Some 50 miles of the cable were recovered by Mr. Bright in October, and the shore end was buoyed.

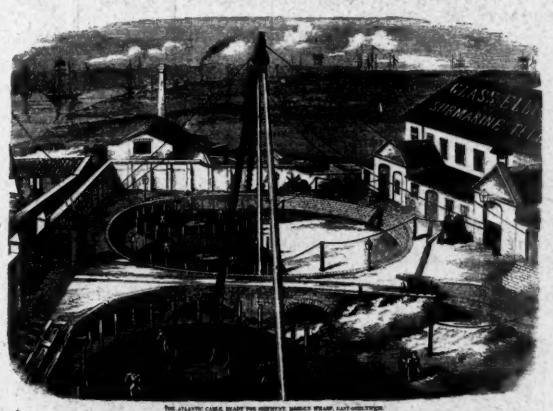
New capital was raised, with difficulty, and 700 miles of cable were manufactured, making, with what remained, a total of 3,000 nautical miles. Improvements in the brake gear were also effected, and Prof. Thomson (afterwards Lord Kelvin), the electrical adviser to the company, introduced a system of rigorous testing during the manufacture of the cable; in the spring of 1858 Prof. Thomson invented his famous mirror-galvanometer, which proved of inestimable value in the subsequent operations, and in the working of submarine cables in general. The same two vessels were also employed in experiments by way of rehearsal.

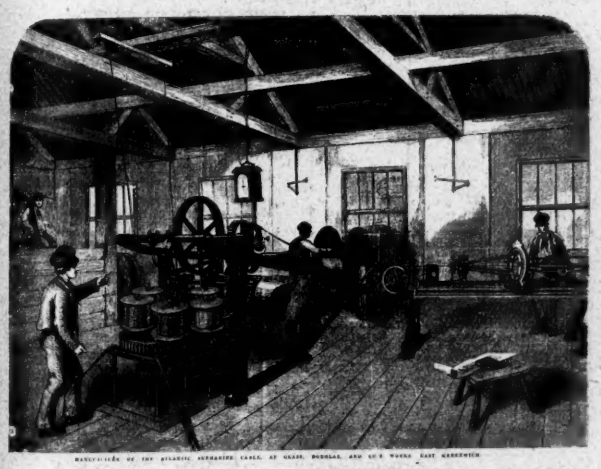
On June 10th the expedition once more set forth, this time to *rendezvous* in mid-ocean. Very stormy weather was experienced, and the *Agamemnon* was nearly lost; it was not till June 26th that the ends were spliced and the bight lowered into the sea. After a false start the vessels got under way, and paid out some 80 miles, when the conductor

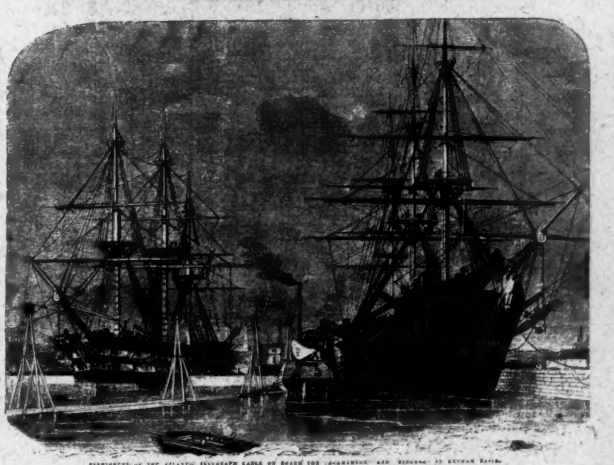
parted at the sea-bottom, to the dismay of all on board the ships. Returning to the *rendezvous*, they made a third attempt, which also failed when 255 miles had been paid out. The vessels arrived at Queenstown on July 5th and 12th respectively, after a most arduous and disappointing voyage.

Failure seemed now inevitable. There were not wanting those—including even the chairman of the company—who advocated the abandonment of the undertaking. But a new chairman was appointed, and a final effort was decided upon. On July 17th the squadron left Queenstown on what was regarded as a "mad freak of stubborn ignorance." They met at their *rendezvous* on July 29th in 1,500 fathoms, and immediately spliced the ends of the cable and began paying out. A break of continuity was reported after seven hours, but after a short period of intense anxiety the signals reappeared (the fault was ultimately traced to the battery on the *Niagara*). In spite of stormy weather, and repeated alarms, due to faults in the coiled cable, threatened collisions with other vessels, and other anxieties, the *Agamemnon* on August 5th steamed into the harbour at Valentia in triumph. The *Niagara* had a far less adventurous voyage, and arrived at Trinity Bay, Newfoundland, on the same day. At 3 p.m. the connection between the two shores was completed, amid universal rejoicings. Some 2,022 nautical miles of cable had been successfully laid, and the possibility of trans-









THE JUBILEE OF THE ATLANTIC CABLE: 1858—1908.
Views reproduced from the *Illustrated London News*, 1857 and 1858.

Atlantic telegraphy had been demonstrated beyond question, one year to the day from the commencement of the first attempt.

We need not dwell upon the festivities and celebrations which followed; Mr. Bright received a knighthood, and with his colleagues, Prof. Thomson, Mr. Canning, Mr. Clifford, and others, was royally entertained. The cable was quickly brought into use, and transmitted some 732 messages during its short life. It broke down on October 20th; but its work was well done. Although some years elapsed before communication was re-established (by the *Great Eastern*, in 1866), the renewal of the struggle was inevitable, and ultimate success practically certain. The influence of the achievement upon the development of the whole of the electrical industry has been incalculable. The limitations of our space, however, forbid our venturing further upon this fascinating subject. Those who wish to pursue it further cannot do better than consult the "Story of the Atlantic Cable," by Mr. Charles Bright, F.R.S.E., the son of the engineer-in-chief to the Atlantic Telegraph Co.; or the "Life Story of Sir Charles Tilston Bright," by his son and his brother, Mr. E. B. Bright. To these works we are indebted for most of the particulars embodied in this article.

LOCALISING HIGH-RESISTANCE BREAKS IN CABLES.

By J. RYMER-JONES.

(*Concluded from page* 205.)

The annexed curve sheet shows the very different percentage of cable charge, or discharge, obtained from *long* cables with the distant end *free* and with various galvanometer suspensions. It will be seen from them that the needle of a Kelvin, or the coil of a d'Arsonval, galvanometer for shore use may be given a sufficiently long periodic time to measure correctly the whole charge, or discharge, of a cable having a K.R. of about one million. As the distant half of any cable *having its further end to earth* takes up only one-third the charge of the nearer half, it is evident that, for the purpose of this high-resistance break test, the galvanometers referred to give the correct charge for a much greater length of cable than is indicated by the respective K.R. values.

As the galvanometer with a large periodic time is exceedingly sensitive, the shunting resistance when measuring the *charge* will be proportionately low and the potential at the

testing end of the cable consequently high, which, as already explained under *retardation*, is an important advantage.

Resistance of Galvanometer Coil g_1 as Shunted.—The form of universal shunt devised by the writer and employed at the Silvertown Works has the advantage that the resistance (r) of the shunted galvanometer coil g_1 required for the capacity *constant* is readily ascertained from the formula $r = \left[\frac{g_1 + (10{,}000 - n)}{10{,}000 + g_1}\right] n$, where n is the scale reading of the shunt used.

The use of an ordinary resistance shunt for a capacity test by charge or discharge introduces an error even with the

EXAMPLES OF TESTS MADE WITH ORDINARY KELVIN ASTATIC GALVANOMETER.

Actual resistance of artificial cable = 188·95ω = 3·0ω per N.M. (assumed). Length = 62·98 N.M.
„ capacity „ „ = 23·157 mfds., *i.e.*, 0·12279 mfd. per 1ω ‖
0·12256 „ „ *

	(1)	(2)	(3)	(4)	(5)	(6) Δ
C.R *by Differential Method*—						
Balancing resistance R *l*... ...	10,546	9,820	19,620	39,000	18,360	19,000**
„ „ corrected‡	—	—	—	—	—	18,322‡
C.R. *by Direct Deflection*—						
Cable: *d* ...	—	358	398	400	335	—
Cable: *s r* ...	—	44	96	192	40	—
Cable: *m p* ...	—	227·3	104·17	52·08	250	—
Cable: cable current δ ...	—	22	23	23	40	very slight
Cable: „ „ side of zero	—	same	same	same	same	same
Constant: D ...	—	357	396	389	333½	—
Constant: S R ...	—	48	96	192	40	—
Constant: M P ...	—	208·3	104·17	52·083	250	—
Constant: $R_c \div$ ...	—	*x*	19,495	39,197	17,825	—
R *l* ...	10,394	10,247	20,382	40,445	20,150	18,625
R *l* ...	10,189	10,189	20,281	40,248	20,108	18,322
Length at 3·0ω per N.M. ...	3,396·3	3,396·3	6,760·3	13,416	6,702·7	6,107
Capacity of Cable—						
R l^{ω} long. F mfds. ...	624·37*	625·6‖	1,245·1‖	2,471·0‖	1,231·7*	1,222·75*
Cable Charge—						
Cable: C ...	339	352	362·5	369	344	270·15σ
Cable: S R ...	200	200	200	200	400	300
Cable: M P. ...	50	50	50	50	25	33·33
Condenser: *c* ...	342½	355½	358½	361	169	384·5
Condenser: *s r* ...	4,500	4,500	4,500	4,500	4,500	10,000
Condenser: *m p* ...	2·222	2·242	2·222	2·222	2·222	1,000
Condenser: capacity K ...	1·002	1·002	1·002	1·002	1·002	1,002
Condenser: constant φ ...	759·6	788·4	795·1	800·6	374·8	383·6
Resis.: R *r* + g_1 shunted *r* ...	205	205	205	205	403	303
Testing current V ...	—	365	363½	363½	172	172·5
Cable „ *v* ...	—	23½†	23†	22†	23½†	12Θ
„ „ side of zero ...	—	opposite	opposite	opposite	opposite	opposite
Ratio $\frac{V}{v}$	—	15·368	15·80	16·52	7·32	14·37
Cable Capacity—						
(End to earth) *f* mfds.	22·315	22·323	22·797	23·045	22·945	23·473
See Tables I and II: $\frac{f}{F}$ ratio ...	·035739	·035686	·018304	·009326	·018627	·020906
See Tables I and II: N units ...	18·032	18·005	9·1956	4·6747	9·356	10·505
Cable Current Equivalent—						
$n = \frac{r \times 1{,}000}{R\,t}$	—	20·12	10,108	5·069	20·10	14·375
Ratio of charge between *n* and N + *n* units—see Tables III and IV.	—	·000108	·000023	·000004	·000104	·000031
Distance of Break—						
Ratio $\frac{f}{F}$ corrected for c. ct. value	—	·035578	·018281	·009322	·018523	·020875
Equivalent N *r* units...	—	17·950	9·181	4·0727	9·3082	10·490
„ resistance	183·72	182·9	186·2	188·1	187·0	192·2
„ N.M. ...	61·24	60·97	62·17	62·70	62·33	64·07
Testing Battery (β)—						
Number of cells	10	10	10	10	5	5

Remarks.

Δ Sealed end of core $\frac{107}{140}$ punctured and tested after being several days in fresh water.

σ Mean of 18 readings, viz., 292, 305, 295, 283, 321, 272, 295, 267, 268, 270, 258, 271, 255, 268, 183, 261, 261, 238 = 4,863
$\frac{4{,}863}{18}$ = 270·15.

÷ R_c includes resistance of battery R *r* and also of g_1 as shunted.

‡ Corrected for cable current and unequal influence of the Kelvin galvanometer coils g_1 and g_2 as shunted for the cable charge C. A resistance of 20,000ω in g_1 circuit was balanced by 20,740 in g_2, *i.e*, a ratio 1 to 1·037.

† A cable current of one Daniell cell at the distant end of line with negative pole to earth.

Θ Natural cable current only.

** Varying at times between 14,000 and 20,000, but tolerably steady at 19,000 during series of charge throws.σ.

ρ Ratio $\frac{V}{v}$.

x As the R *c* used for this example is uncertain, the *actual* R *l* and R *t* have been used, as in Example 1, instead of the calculated values, as in Examples 3, 4, 5 and 6.

β Internal resistance of battery = 0·5 ohm per cell.

Example 3—*Working out*—

C.R. *d* = 398
23
375 = 2·57403
104·17 = 2·01773
4·59176

R *t* = 20,382 = 4·30925
101
R *l* = 20,281

Constant.
D = 396 = 2·59770
104·17 = 2·01773
4·61543
19,301 = 4·28558
8·90101
4·59176

Capacity F.
20,281 = 4·30709
1·08916
3·39625
2)2490·3
F = 1,245·1

Condenser.
358·5 = 2·55449
2·222 = 2·34678
2·90127
1·002 = 0·00087
795·1 = 2·90040
f = 22·797 = 1·35788
1,245·1 = 3·09522
$\frac{f}{F}$ = ·018304 = $\bar{2}$·26266

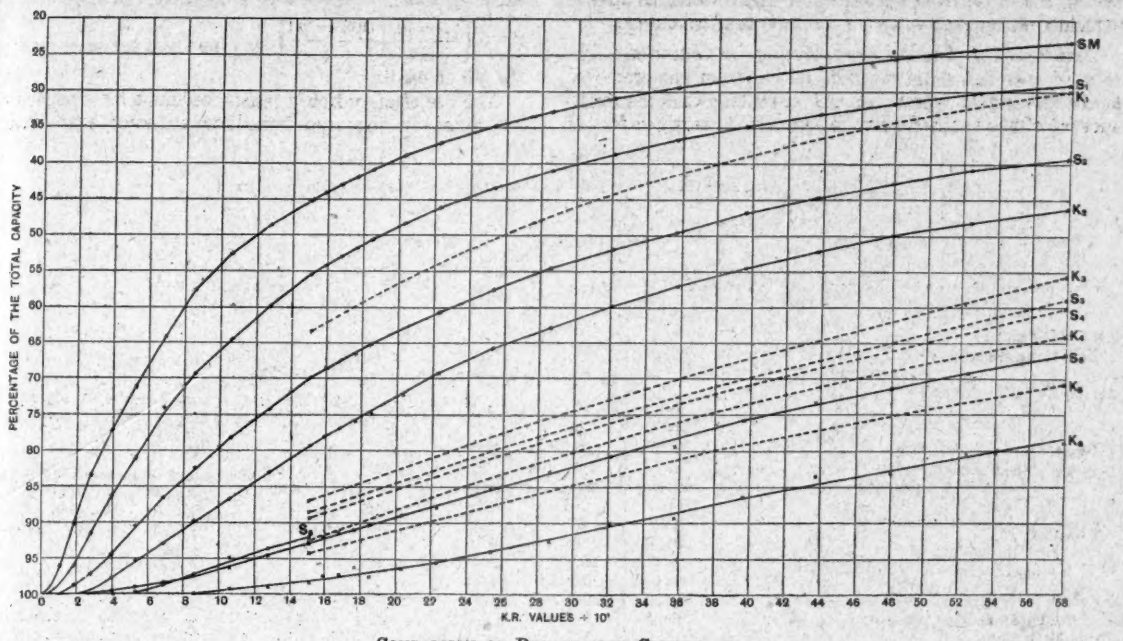
Cable capacity.
362·5 = 2·55931
50 = 1·69897
4·25828
2·90040
1·35788
3·09522

(N)
·018304 × 9
·017919
= 9·1956 units from testing end. (See Tables I and II.)

Correction for Cable Current.
(N) 205 × 1,000 / 20,486 = 10·007
Units.
19 = ·000361
10 = ·000100
9 = ·000261
See Tables III and IV.

∴ Cable current charge = $\frac{9{\cdot}1956 \times {\cdot}000261}{9{\cdot}0 \times 15{\cdot}80\rho}$ = ·000023

Distance of Break = $\frac{9{\cdot}181}{1{,}000} \times 20{,}281 = 186{\cdot}2$ ohms, or $\frac{9{\cdot}181}{1{,}000} \times 6{,}760{\cdot}3 = 62{\cdot}07$ N.M. from testing end.



COMPARISON OF RETARDATION CURVES.

Showing the percentage of the total capacity as measured by discharge test when using various kinds of galvanometers and suspensions. Each curve is plotted for the same K.R. values—the true capacity of the condensers of the several cases of A L, unretarded by conductor resistance, being taken as 100.

Curves K_1 K_2 S_2 S_3 S_4 K and K_5 are based on the two extreme percentages—viz., for the K.R. values 1,510,000 and 5,830,000—which alone were measured, the intermediate dotted portion being made to conform approximately to the two lined curves adjacent to them.

No.	Curve.	Galvanometer.	Resistance.	Periodic time.	Time in returning to zero.	Discharge from 1 mfd. per cell.	Mirror to scale.	Suspension. Top.	Suspension. Bottom.	Suspension. Length.	Remarks.
			Ohms.	Secs.	Secs.	Divs.	Ft. In.	In.	In.		
1	S.M.	Sullivan (marine) No. 222 ...	1,089	½	¾	101	3 2	1½	1⅞	—	Ordinary coil with aluminium frame; flat phosphor-bronze wire—medium.
									Turns	Dia.	
2	S_1	„ (shore) No. 235, coil No. 1	866	—	—	242	3 2	1 1/16	16	1/16	Spiral wire ·002 in. Coil has aluminium frame.
3	S_2	„ „ „ „ No. 2	1,464	—	5	174	3 2	1 7/32	4	1/16	Spiral wire, thicker and wider, aluminium frame.
4	S_3	„ „ „ „ No. 1	866	7⅞†	27	775	3 2	1 1/16	16	1/16	†New upper wire much finer than No. 2. Coil has aluminium frame.
5	S_4	„ „ special coil ...	1,280	8	15	751	3 2	1·73*	8*	1/16	*·002 in. wire flattened. Coil has no aluminium frame.
6	S_5	„ „ „ „ ...	1,280	—	16‡	816	3 3	3·86	8	1/16	‡Same as No. 5, but longer upper wire. ·002 in. flattened.
7	S_6	„ „ No. 235, coil No. 1	866	—	—	840	3 2	1 1/16	16	1/16	Same as No. 4, but finer upper wire.
8	K	Kelvin non-astatic, two coils ...	3,065	2½-3	—	65	3 6	¾			Heavy mirror ¾ in. diameter, and heavy needle. Silk fibre coarse. Directing magnet low down. Has extra vane on below. ÷
9	K_2	„ astatic No. 185, four coils	7,046	6½	—	186	3 2	1 3/16			Small mirror ⅜-in., and small needle.
10	K	„ non-astatic, two coils ...	3,065	7·1	—	170	3 6	¾			Same as 8, but finer fibre and directing magnet higher.
11	K_4	„ „ „ „ ...	3,065	8¾	—	190	3 6	¾			Same as 8, but lower vane ÷ off and system weighted. ‖
12	K_5	„ „ „ „ ...	3,065	12¼	—	?	3 6	¾			Same as 11, but directing magnet higher.
13	K_6	„ „ „ „ ...	3,065	15	—	286	3 6	¾			„ 12, „ „ „

NOTE.—The above Kelvin non-astatic is generally used with a lower vane in oil for speaking. For these curves the oil vessel is removed.
÷ Area of vane 3/16 in. × 1 1/16 in. ‖ Weight of system, 32 grains. Extra weights, 5½ grains.

GENERAL NOTES.

Increasing the testing battery and suitably decreasing the S.R. of *universal shunt* does not affect the percentage measured. The percentage of capacity measured depends on the periodic time, *i.e.*, on the degree of control which determines the inertia. For instance: In the case of the d'Arsonval coil the inertia depends on the relation of the suspending wire and spiral to the weight of the coil; and in the case of the Kelvin galvanometer, on the relation of the fibre (or directing magnet) control to the weight of the suspended system. Thus a comparatively light mirror and needle may have the same inertia as the heavier coil of the d'Arsonval galvanometer provided that the control of the former (whether mechanical or magnetic) is made the same as that which the suspending wire above and the spiral below exercise on the coil. Any difference in the *electrical sensitiveness* of the two systems will not alter the percentage result except in so far as the increased sensitiveness is obtained either by employing a finer suspension or weighting the system, both of which reduce the control, and, therefore, increase the inertia. In view of the controlling influence of the spiral below the d'Arsonval coil being important, this spiral should be made as fine as is safely practicable (say, of ·002 in. diameter wire), and have many turns in order to secure a high degree of inertia; and additional weighting will contribute to the same object.

Magnetic-damping in the aluminium frame (if used) should be reduced to a minimum by fine *slits* in several places; and air-damping, in the case of the light Kelvin galvanometer suspension, by using only a thin wire instead of the usual broad vane, to prevent it swinging entirely round.

The curves represent the measured percentages of the true capacity when the distant end of the cable is *free;* and are more strictly applicable when the break resistance is very high and the length of cable in circuit moderate compared with that resistance. When the break resistance is only a few thousand ohms, there will be a decided "fall" in the cable, so that the more distant part will hold a smaller charge, and the percentage due to retardation in this part—the charge of which reaches the galvanometer last—will, consequently, be less than that shown by the curves. How much less will be roughly ascertainable by comparing the first calculated length of cable to the break with the total resistance of $R l$, which will approximately give the potential at the distant end of the cable, and be a guide as to whether the *full* correction is to be allowed.

Kelvin galvanometer, and for a suspended coil form of galvanometer is, of course, inapplicable.

Reproducing the Deflection d and Charge Throw C.—To avoid the possibility of error due to want of perfect scale proportionality, which with the coil suspension of galvanometers on the d'Arsonval principle sometimes amounts to 4 per cent., or even more, it is desirable always to approximately reproduce the same deflection and throw for the *constants* as for their corresponding cable measurements.

Short-Circuit Key.—To avoid having to employ a short-circuit key on galvanometer coil g_1 and another on g_2 working coincidently, the writer makes one suffice by connecting it between points 10 and 11 for the *balance* and *cable charge* measurements, and between 10 and 9 for all the other measurements, during all of which coil g_2 is not in use.

Bridging points 10 and 11 with a short-circuit key causes an equal amount of the charge applied by K, to pass into the cable through the equally shunted coils g_1 and g_2, and thereby protects the suspension from a violent movement due to any disparity in the cable circuit and the compensating circuit R *b*—which latter is at starting made approximately equal to the measured resistance (R *l*) of the cable. Yet even while the short-circuit key remains closed there will be *some* deflection due to the unequal influence of the coils g_1 and g_2 on the suspension. By giving to the shunts U_1 and U_2 an equal and *low* slide value to start with, this deflection can be prevented from going off the scale, and when the charge has entered the cable the short-circuit is momentarily opened by *tapping* while adjusting the balance with R *b*. As the balance is perfected, the values of the shunts U_1 and U_2 are both equally increased, if necessary, to obtain a suitably large throw for the cable charge (C), as already mentioned.

PRIVATE BILLS IN THE PAST SESSION.

[BY OUR PARLIAMENTARY REPRESENTATIVE.]

Excluding Electric Lighting and Tramway Provisional Order Bills, and Scotch Provisional Orders, there were 42 Private Bills introduced into Parliament in the past session which contained clauses affecting the electrical industry to a greater or lesser degree. It must be admitted, however, that the majority of the Bills created little or no interest, except to the parties immediately concerned, whilst several of those which did look like arousing keen opposition were allowed to drop in their early stages. Speaking at the annual meeting of the largest promoting electrical company a short time ago, the chairman remarked that there is still a large field for the investor in electrical undertakings in this country, but certainly the promoter seems more shy every year of coming to Parliament; whilst the municipal Corporations, many of which have found their dabblings in trading ventures far from being as successful as was anticipated, are much less eager than they were a few years ago, to go in for more. The one problem which appears likely to be solved, or partially solved, this year is that of the supply of electric power for London. Three Bills are now on the stocks, and the promoters of the chief of these—viz., the London and District Electricity Supply Bill—have still many obstacles to overcome before the project can be successfully launched. The details of this Bill must be so thoroughly well known by now that little need be said regarding it. In many respects it follows the lines of the Administrative County of London Bill, which is practically the model on which all the succeeding Bills have been based. Much the same area is embraced, but there is only to be one generating station at Barking. The chief new element which has been introduced is the purchase clause, and the London County Council, or any other body which may be authorised, is to be the purchasing authority. So far the Bill has passed Lord Cromer's Committee of the House of Lords, after a most exhaustive inquiry, in the course of which Lord Cromer and Lord Welby had full scope for exhibiting their mastery of financial detail. Now a Committee of the House of Commons has been appointed to further consider the Bill in the Autumn Session, and the Chairman of this will be Mr. Luke White, who, it will be remembered, was Chairman of the Joint Committee which considered and rejected the first Bill promoted by the London County Council. The other two Bills which are coupled with the London and District are the London Electric Supply and the London (Westminster and Kensington) Electric Supply Co. The first was a proposal to enable a number of the electric supply companies to combine together and form a joint committee and supply electricity in bulk. We say *was*, because this portion of the Bill was rejected by Lord Cromer's Committee, which, however, has allowed clauses to go forward which will enable the companies to link up their systems for mutual assistance. There was really no opposition to the London (Westminster and Kensington) Electricity Supply Bill, which seeks to enable the two companies mentioned, the St. James's and Pall Mall, the Notting Hill, and the Central Electric Companies, to link up their mains for power supply. As already stated, all three Bills go before Mr. Luke White's Committee, and with regard to the latter it has been suggested that the London County Council shall be the purchasing authority instead of the Westminster City Council.

There were three other Electric Power Bills brought in, but only two engaged the attention of Committees. The most novel was the Dublin and Central Ireland Power scheme, by which it was proposed to generate electricity from gas made from peat, by a process which it was stated has been successfully carried out on the Continent. An unusual course of procedure was adopted in reference to this Bill. It was rejected by the House of Commons Committee and then recommitted to the Committee by the House itself for further consideration. It came back shorn of much of its glory, for the area sought to be embraced was greatly modified, and the City of Dublin was altogether excluded. The South Wales Electrical Power Distribution Co.'s Bill disclosed a melancholy condition of affairs, and the disastrous history of this concern has doubtless been one of the causes for the timidity of the promoter. The power sought in the Bill is to part with a very large portion of the assets of the company to satisfy creditors and others, although the company will still exist as the statutory undertaker, and may save a little from the wreck in course of time. The third power scheme was that of the Great Eastern Railway Co. to supply electricity from their generating station at Parkeston to manufacturing tenants on their estate and others. The local authorities quickly took alarm, and we believe the machinery of the Association of Municipal Corporations was put in motion. The company preferred not to fight and dropped the clauses. What may almost be called a power scheme was also included in the Lower Thames (Grays) Dock Bill, for it was proposed to erect a generating station at West Thurrock and generate electricity for dock purposes. Mr. Lloyd-George, however, nipped the scheme in the bud by bringing in his Port of London Bill, and the promoters early withdrew.

Coming to the tramway schemes promoted by companies as distinct from local authorities, by far the most interesting was the London and Windsor Motor scheme which, however, never got beyond the Standing Order stage. The scheme was to have a motor road with a tramroad on either side, and the point which was keenly fought was whether the Bill was of the class which necessitated the deposit of full detailed plans. Mr. Campion, the experienced Examiner, after a very careful hearing, decided that they were necessary, and in giving his decision he alluded to the importance of the Bill as being in all probability the pioneer of many similar schemes. There is little doubt that the Bill will be revived next year.

The consideration of the London United Tramways Bill was chiefly notable for the opportunity it gave Sir Clifton Robinson of uttering his candid opinion regarding the methods of local authorities when private undertakers want facilities; but before the Bill got to the Committee the company scored a distinct victory over the Surrey and Middlesex County Councils. The company wish to go over Kew Bridge, and as they would not submit to what they considered the extortions of the local authorities, the County Councils exercised their power under the Tramways Act and refused their consent. The company, however,

argued the full case before the Examiner, who waived the veto, and made a special report, and accordingly the Bill went to the Select Committee on its merits. In the end the victory of Sir Clifton Robinson was only partial, as the company will now have to pay a rent far higher than they consider reasonable, although it will be far lower than they were first asked to pay. The Highgate Hill Tramway Bill was a proposal to electrify the well-known cable tramway in that district, but it was withdrawn, as the matter will in all probability be taken in hand by the London County Council before long. Two other London suburban schemes were West London, Barnes and Richmond Tramways Bill, and the Croydon and Southern Tramways Bill. The objects of the Bills are sufficiently explained by the titles, and both had but brief lives. The Metropolitan Electric Tramway Co. succeeded in getting their Bill for the construction of a new tramway from Harrow Road to Edgware Road, after making arrangements with the London County Council regarding that portion of the tramway within the county. Of the two provincial tramway Bills promoted by companies, the Nottingham and Derbyshire Tramway Co. got extended powers with reference to the construction of authorised lines, and the Macclesfield and District Tramways Co. were authorised to wind up.

A number of municipal corporations had Bills dealing wholly or partly with tramways. The Belfast Corporation asked for authority to purchase the undertaking of the Cavehill and Whitewell Tramway Co. for the sum of £60,000, but the Bill was rejected on second reading in the House of Commons. The Burnley Corporation was authorised to spend £70,000 on tramways, and the Hull Corporation about the same amount. The Leeds Corporation will be enabled to spend £90,000 on tramways in and around the borough, and a further £15,000 under the Pudsey Tramways Order of 1905, which it is taking over. The London County Council proposals showed a marked falling-off as the result of the last election, and the Bill only contained powers for the construction of about 4⅓ miles of new tramways. Sanction was also given to use the overhead system on the Hammersmith to Putney line, authorised in 1902. The Morecambe Corporation brought in a Bill for purchasing the horse tramways of the local company and electrifying them at a cost of £50,000 odd, but dropped it quite early in the session. Other local authorities which obtained further powers with regard to tramways were Bolton, Bristol, Blackburn, Doncaster, Liverpool, Stockport, Wolverhampton, and Rochdale.

Leicester Corporation was empowered to supply electric energy for tramway purposes; Keighley Corporation to supply in bulk outside the borough; Manchester Corporation to take over the Gorton Electrical Supply Order and the Levenshulme Electric Lighting Order; Dundalk U.D.C. to erect a generating station; Ravensthorpe U.D.C. to supply electric fittings; and the Draycott Gas Co. to apply for a provisional order to supply electricity.

Only three electric railway Bills were promoted. The Metropolitan District Railway Co. got authority to re-arrange its capital, and the Great Northern, Piccadilly and Brompton Railway powers of a similar character; whilst the North-East London Railway Co. got a still further extension of time for the construction of its authorised undertaking which is greatly needed, owing to the difficulty of raising capital.

South Africa.—The Johannesburg municipal authorities have now definitely decided to commence litigation against Messrs. D. Stewart & Co., Ltd., and their sureties, Messrs. W. and J. Beardmore, for the recovery of the sum of £115,134 named in their bond; the legal proceedings, it will be remembered, are in connection with the alleged failure of the gas-producer plant supplied by the contractors. Meanwhile, the Corporation's existing direct-current plant, with the 200-kw. dynamo recently purchased from the Victoria Falls Power Co., Ltd., will enable the present service for town lighting and tramways to continue, but it allows no margin for additional consumers in town, or in the event of a breakdown, and on account of this fact the Victoria Falls Co. was approached with a view to the continuance of the present supply of 400 kw. direct current for a period of one year from July 1st, 1908, but as the terms were considered too onerous, it has been decided to call for tenders for an additional 1,000-kw. direct-current set, with condenser and boiler, to be erected in December, the cost of which is estimated at £21,000.—*British and South African Export Gazette.*

CORRESPONDENCE.

Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Live Steam Feed-Water Heating.

Referring to the letter by "Veritas" in your issue of July 31st, it is not likely that any reply will be issued to the articles by "Albert Jonel," which are obviously of a malicious nature and written under a *nom de plume*.

The case referred to by "Veritas" of a Thames tug fitted with an internal heater which was choked up in a week, seems to me to confirm the fact that an internal heater is an excellent preventative of scale formation on the heating surfaces of a boiler, but in this particular case, the water evidently contained an excessive amount of impurities, and the heater collected more sediment than it was adapted for. It is obvious that an internal heater cannot be used as a universal water purifier, but the fact remains that it does collect sediment which would otherwise be deposited upon the heating surfaces and would quickly form scale. In cases where there is much deposit, it is always possible to give extra clearances in the heater, so as to avoid any likelihood of its becoming choked up; but, of course, the apparatus requires reasonable attention and the sediment which is collected should be removed at regular intervals. If the water contains a large percentage of impurities, it should be separately treated, before it is fed into the boiler.

"Veritas" goes on to point out that in the advertisements of one type of live-steam heater he finds no definite claim of increased efficiency; but I do not see how a manufacturer can be expected to set forth definite guarantees in his advertisements, as so much depends upon the size and type of boiler and the conditions of working.

If "Veritas" is a steam user, and wishes for any definite information on this point, I shall feel obliged if he will kindly send me his name and address.

J. L. Cateaux.

London, E.C., *August 7th*, 1908.

A Service Problem.

A problem which must often occur to all central station managers and engineers, is the question whether or not it will pay to make certain extensions to the distributing system, or put in any particular "service" which lies within the option of the supply department. I should be greatly obliged if some of your readers would give me their views as to the best principle to work upon, and how to decide a question of this kind.

For instance, application is made for a supply from a certain consumer, and it is found that the cost of the service will be, say, £20. The total works cost per unit for the station is, say, 4·5d., and the cost per unit for coal 1d. The average price received from private consumers for energy is 10d. per unit.

How many units should such a consumer be expected to use per annum in order that this service should be a source of profit to the department? Total capital, say, £21,000.

Australia.

Electrical League.

I have read in your issue of July 31st, No. 1,601, page 167, the letter from Mr. Borlase Matthews, and your somewhat caustic editorial note, following that communication, has not escaped my notice.

I trust that I may be pardoned by you for any accusations you may be induced to lay at my door on the score of my approaching this matter, so far as you are concerned, in any spirit of criticism or antagonism. Nothing is further from my desire.

Since, however, we all realise that the faculty of criticism is more easily found in its destructive, rather than its constructive aspect, surely it would be more helpful if all of us rather encouraged the efforts of Mr. Borlase Matthews than damped his ardour.

You ask "Who is going to make the efforts that are only to be *seconded* by the Provisional Committee? Who is the fortunate person that enjoys the confidence of all sections of

the industry, and is to be induced by the unknown prime mover to bring together, &c.?" May I be permitted to put the third question, Is it not somewhat premature at this juncture to raise these queries?

I enclose you herewith extract from the *City Press* of July 18th, 1908. My letter upon which that paper speaks was addressed to the *Times* under date July 14th, 1908. By a perusal of either of these letters, I think that some, at least, of the suggested objects of the league or union can no longer be considered nebulous.

Naturally, at the outset it must necessarily seem to resemble a debating society, but surely so long as those debates may prove of eventual service to the electrical community, none of us should have cause for complaint on this score. Larger movements than this have had even smaller beginnings. I, for one, am prepared to lend what little service I can to the ideas put forward. I feel sure, Mr. Editor, if at this juncture you may be inclined to view the attempt which Mr. Borlase Matthews is making with some scepticism, that as you say you will nevertheless be the first when the time arrives to ventilate through your valuable columns any apparent good which results.

May I, in conclusion, with deep respect therefore tender the suggestion that your paper, one of the leading electrical trade journals of this country, should for the moment rather suspend its judgment, and if as an outcome of the "debating society" any "well considered plan with definite objects" should be evolved, I express the hope that like other of your contemporaries, you will then encourage rather than scoff at that small gathering of pioneers, who, I take it, seek their inspiration in the motto "Nothing venture nothing have."

Edward Bergtheil.

London, E.C., *August 5th*, 1908.

[We have no desire to pass judgment upon the scheme to which our correspondent refers; in the absence of details such as those asked for in our note, it is impossible to do so. We based our comments upon Mr. Borlase Matthews's letter, which contained a distinct suggestion that some body or person, whose identity was not disclosed, was about to open a campaign of some sort, headed by someone else, and *supported* by this League—that, in fact, the League itself was not the prime mover, but someone in the background.

The scheme, so far as it was disclosed, bore unmistakable marks of common origin with the previous scheme, to which we referred; the latter was managed with a lack of tact and discretion which could not fail to injure its prospects of success. It does not follow that the present proposal will be conducted on similar lines; we have no animus against it, and, as we have reiterated, we shall be pleased to place before our readers any well-considered scheme with definite objects—but we cannot be expected to support we know not what.—Eds. E.R.]

The Electrical Industry.—What is Wrong?

In your last issue (page 223) you ask the question, "What is wrong with the Electrical Industry?" I feel tempted to reply to this question by quoting various pessimistic paragraphs from the current issues of the various electrical journals, but it will be fairer to you that I should confine myself to the Electrical Review. In submitting the following quotations from your editorial columns I wish to say that, while I am satisfied that the excerpts are perfectly fair, I do not rely upon them only, but wish to refer to the whole of the articles from which they are taken in support of my suggestion that the best answer to your question can be found by a little sympathetic introspection:—

Engineering (page 1053).—Engineering, including, of course, electrical engineering, is one of the most overcrowded and underpaid of the professions. For the amount of time and money sunk in a thorough engineering training the financial return is pitifully meagre. There is a glut of engineering brains on the market, and the supply has for a long time been far greater than the demand.

Annual Tables (page 1055).—Little progress apparently is made by the majority of power companies—several of them exist but in name, and more than one is in liquidation or in course of reconstruction. Only one new railway appears in our list issued last week, and the number of tramways has practically come to a standstill.

Purchase of Tramways (page 974).—Tramway companies whose property is likely to be taken over by a local authority must not assume that when the purchase price is being assessed they will get full value for their undertaking.

Trade Unionism (page 973).—One need only mention the Factory Acts, the Employers' Liability Act and the Workmen's Compensation Act to remind the reader of the way in which the Legislature in its wisdom has hampered employers in recent years.

(Page 934).—There is no denying the fact that so far as engineering work is concerned the action of Trade Unions in this country has had the effect of driving a great deal of work abroad.

Rating of Tramways (page 935).—Complaint is loud that the business of a tramway company is seriously hampered by the burden of local rates.

Competition (page 893).—The stress of business competition has in these days passed beyond reasonable limits.

Promoting Trade Interests Abroad (page 766).—The suggestion is one well worthy of consideration by the Council of the Institution of Electrical Engineers, though past experience does not lead us to think that that body can stoop from its dignified professional position to occupy itself with a matter which is so purely a *trade* affair.

Contract Conditions (page 725).—Those conversant with the general conditions of contract prevailing on the Continent will at once acknowledge that even the conditions suggested by the Institution of Electrical Engineers are abnormally severe on the contractor, and it is certain that many of the still severer conditions found in other specifications would be unacceptable to any firm of contractors of repute on the Continent.

Support of Home Industries (page 425).—Whatever may be the opinion held on the subject of Free Trade *v.* Protection, or regarding the best means of improving at the present time the unsatisfactory condition of the electrical industry in this country, there can be no difference of opinion as to the claims which home industries rightly have upon our support.

Electrical Manufacturing Position (page 426).—It is generally agreed that electrical manufacturing in this country has arrived at a state when many manufacturers sadly in need of business are offering to accept work at prices which are generally acknowledged to be below the cost of production.

(Page 294).—The supply of electrical machinery in this country is far greater than the demand, and so long as this state of things continues it must inevitably result in a weeding out process and a consequent gradual extinction of the weaker firms.

(Page 249).—It is almost tiresome to repeat the story of how prices are thus depressed until it has become an axiom in electrical business that the next worst thing to losing an order is to secure one. But while the English manufacturers are, with very few exceptions, fighting among themselves for this poorly paid class of work, the Germans and other exploiters of foreign made machinery are carefully keeping aloof from this struggle for bare bones, and are quietly concentrating the whole of their energies on securing the plums of industrial electrification. . . . With a vigorous enemy in the field, and one with a wide and deep knowledge of the manifold applications of electricity, the home manufacturer has before him no easy task.

Combination (page 294) (The heading of this article was "Price-Cutting" not Combination—Eds. E.R.).—It is well known that one of the greatest obstacles to the prosperity of the electrical trades is the lack of spirit of fraternity and loyalty to kindred interests.

Electrical Finance (page 42).—The electrical manufacturing investor has had very little return upon his capital save in the case of the cable companies, toward whose profits, we trow, longing eyes have been cast for a number of years. But no one can put his finger upon one characteristic and claim that as the cause of fallen profit; for, as well as what has happened in the way of competition between manufacturers, there have to be borne in mind the effects upon electrical manufacturing of the changes, delays and want of development occurring in electricity supply and power and electric tramways and railways.

Municipal authorities in big towns may charge low fares and make profits, and this sort of thing has, in a way, indirectly fixed the fares chargeable under concessions in smaller and quite dissimilar places.

Many are the causes of what we have recited above, and they are not all the result of conditions. Sometimes men and their methods have been to blame.

I have confined myself to your editorial articles during the current year, but one might easily prolong the melancholy recital, as will be seen by a retrospective glance on the first page of this year's Electrical Review, the opening sentence of which, referring to the past year, is: "It has been in fact a very flat, stale and commonplace period in electrical history." But that the troubles are not of recent development is shown by your leading article of January 18th, 1907, in which you commence a summary of the position with the statement: "That the electrical industry is in a precarious condition will be denied by no one."

E. Garcke.

Donington House, London, W.C.
August 11th, 1908.

[Mr. Garcke commences his letter by distorting our title. The correct rendering we now give at the head. Perhaps some of our readers recognised the vein in which our "What is Wrong?" question was asked. What is wrong with the *Times*, with its contributors, with Mr. Garcke's

Manual, that they are not in agreement—who was on holiday? No doubt Mr. Garcke regards the appearance of the review of his *Manual* as unfortunate, and ignoring our reference thereto he proceeds to reply to a question which our readers do not dream that we should at this date ask them to answer. Mr. Garcke's own quotations show that we are very well informed as to some things that are wrong, and we are glad that he has followed our articles so closely. But is it altogether fair for him to ignore, when quoting from them, the various remedies that we have suggested? Some of his quotations are calculated to give a wrong impression to the reader, because they have been ruthlessly, and, may we say, conveniently, uprooted from their context.

Now, Mr. Garcke accepts the whole of our articles, he does not rely upon the excerpts. Well, then, let us see where we stand. We must suppose that Mr. Garcke in advancing the interests of his Electrical League considers that it is going to be the means of remedying the variety of evils that we have enumerated in our articles. That is, a Debating Society—every member of which would, as its hon. secretary suggests, attend with his mind made up on his own particular subject—is going to confer the following, and a few other more or less trifling benefits upon the electrical industry:—

1. Prevent overcrowding of the engineering profession.
2. Make up for early power company mistakes, optimistic miscalculations, and extravagant prophecies!
3. Settle the subject of tramway purchase prices. (Are there not many tramway organisations, and are not Mr. Garcke and his friends very strongly entrenched in one of them?)
4. Correct the socialistic and labour legislation tendencies of the present Government and of the times. Control Trade Unionism.
5. Secure reduced assessments for local ratings for tramways. Again, are there not many tramway organisations?
6. Stay the course of business competition.
7. Conduct inquiries concerning foreign trade opportunities.
8. Lighten the burden of the contractor in the matter of onerous conditions of contract.
9. Encourage the support of home industries and stamp out foreign competition (incidentally introduce protection for the electrical industry).
10. Raise electrical manufacturing prices all round.
11. Reduce the manufacturing capacity of the electrical works of the country. (Who will give way? Let the League decide!).
12. Promote a spirit of fraternity and loyalty to kindred interests. [*Sotto voce*, Every man for himself, God for us all, and the Devil take the hindmost.]
13. Show the effect of past errors in electrical finance upon the course and present position of British electrical industry.
14. Indicate which men and what methods have been to blame, so that they may be avoided in future. Homocea! —Eds. E.R.]

The Lighting of the New Whitworth Institute.—We learn that the New Whitworth Institute, the latest bequest under the late Sir Joseph Whitworth's will, to the City of Manchester, which was formally opened to the public on Wednesday last, is lighted throughout by means of Nernst and Aegma metal lamps. The new buildings comprise a noble entrance hall, a large gallery, fine library, concert room, curator's room, and a very beautiful hall on the first floor, to be used for meetings and lectures. The whole of the ground floor, including the entrance hall, is lighted by means of 111 ½-amp. Luna Nernst lamps (oxidised copper), 12 1-amp. ditto, 10 1½-amp. and two 3-amp. multiple Nernst lamps, five "D" type, and 28 ½-amp. "A" type Nernst lamps, giving approximately 21,678 c.p. The first floor, *i.e.*, lecture hall, &c., is illuminated by about 200 50-c.p. Aegma metal lamps, wired two in series, fitted in special glass shades. We understand that the curator and committee went to much trouble to ascertain which was the most satisfactory artificial illuminant for a picture gallery, and eventually decided upon Nernst lamps, as mentioned above. Messrs. Crews & Handford, of Blackfriars Street, Manchester, were the consulting engineers to the Institute Committee, and the work was carried out by Messrs. E. M. Evans & Son, of Fountain Street, Manchester, the Nernst and Aegma lamps being supplied by the Electrical Co., Ltd., 121-5, Charing Cross Road, W.C.

TANGLED TOPICS.

By INNOCENS.

English, pure and undefiled, is about as desirable in an electrical engineer as a conscience of similar description, and just about as easily obtainable. To get a true idea of the force of this statement, let anyone try to imagine the mental attitude of the "young person" for whose sake the modern music hall is rendered innocuous, or, better still, a maiden aunt, if she were confronted with a superheated engineer-in-charge busy explaining to a switchboard attendant the technical absurdity of having short-circuited a traction feeder panel.

It is, therefore, cooling and refreshing, even as a soda fountain in the dry and dusty Strand, to read the remarks of Mr. William D. Ennis, on "The Importance of English in the Work of the Engineer," as recorded in the *Engineering Magazine*. As Mr. Ennis remarks, the root-idea of engineering is form, with its variations of informing, conforming, reforming, formulating and performing. Occasionally it includes another and more formidable form of activity—namely, to deform. This function can be best seen in the operations of a gardener-dynamo-attendant truing up a commutator with a 10-in. file. This naturally leads us to another passage in the article: "The language of the engineer must be so clear that he who runs must read." Cases have been known when its effect has been that he who reads (or hears) must run. "Let two men write reports from the same data; one report will flash its meaning upon the reader, the other will bewilder him. The difference is of language."

This reminds me of the case of Binks. I forget where I saw the case, or whether this was really his name. Binks, however, seems appropriate. He was a high-pressure reporter. It doesn't matter which electrical paper he was on, or which failure of supply he was sent to report. Sufficient to say that time pressed, the paper had to be got out to date, and Binks was told to wire his report and to cut it short. His wire read, "Engineer instructed to pump boiler up and blow her down. Pumped her down and blew her up. Funeral to-day. No flowers by request." I do not claim originality for the story, but it emphasises the point.

Mr. Ennis adduces a few passages of approximately equal length from an editorial article in the New York *Sun*, an epistle of St. Paul, Mark Antony's oration, and recent technical articles, from which he deduces that the extent of vocabulary is from 169 to 189 words. I once heard a fitter address a pupil who had accidentally dropped a ¾-in. spanner on his (the fitter's) toe in a striking passage containing about 350 adjectives only, without reckoning substantives, and he did it without stopping to take any breath to speak of. I remember this perfectly well, as I happened to be the pupil. I mention this in order to show that the engineering language is, perhaps, somewhat richer in variety than Mr. Ennis supposes.

This brings me to my main argument, which is that "the divine art of using words" (to purloin the author's quotation) should be a fitting subject for the consideration of the Standardising Institute. Doctor Glazebrook has recently suffered many things of the scribes by using, as I understand the matter, the National Laboratory for tests on commercial manufactures; but surely, here is an object which would be received with universal acclamation. Values for dielectric resistance, viscosity and melting-points of various workshop sentences should be determined, and the elongation under very high temperatures of plastic phrases would be investigated. A standard code on the principle of Liebers or the A.B.C. could be constructed for the interchange of ideas per telephone on the subject of overdue machinery, with the beneficial result of reduction of strain on the tympani of the telephone girls. As Mr. Ennis observes, "To follow the workings of another man's mind is always a broadening thing."

Mr. Ennis reaches the conclusion that "It was the argument of Comenius that the proper education of the mind should comprise, last of all, the training of the critical faculties . . . . . The study of English in the technical school should train this critical faculty." I would go

further. I would suggest that the study of English as she is utilised in the shops would develop, not merely the critical faculty, but also the organs of veneration, application, and discretion in the mind of the technical student who leaves college with the general idea that he is the last and noblest creation upon earth.

BUSINESS NOTES.

Catalogues and Lists.—Edison & Swan United Electric Light Co., Ltd., 36 and 37, Queen Street, London, E.C.—Leaflet showing several designs of Ediswan outside fittings for shop window and street lighting, and stating prices of same.

Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, London, E.C.—Leaflet concerning their "Sirius-Efesca" metal filament lamp, in which a few simple facts and statements of interest to consumers are set out. These lists are issued by the company, with blank space for name and address, for use by contractors, electrical engineers and the trade generally.

Union Electric Co., Ltd., Park Street, Southwark, S.E.—Mailing card, as sent to non-technical consumers, illustrating the moth-attracting powers of the "Excello" arc lamp; also a new list, No. 8,014 (six pages), giving particulars, illustrations, prices and code words of ammeters and voltmeters in water-tight cases.

Messrs. Ward & Goldstone, Springfield Lane, Salford, Manchester.—New catalogue, of 100 odd pages, containing particulars concerning a variety of accessories for electric light and power. The firm is so well known for its manufactures, such as fuses and fuseboards, fuse-boxes, main, ironclad and other switches, and so on, that it is needless to enumerate all the different classes included in the book. Mill and colliery electric light fittings, hand lamps, steel conduits and fittings, cut-outs, ceiling roses, and other such things, electric lamps of various types, fans, motor-starters, wires and cables, and electric bell manufactures, are some of them. In addition, a supplementary art fittings section appears, in which are some excellent designs of electroliers, brackets, hall lanterns and other such fittings for effective electrical illumination.

Messrs. C. W. Leavitt & Co., 220, Broadway, New York.—Leaflets relating to the use of magnesium for producing sound copper castings in sand, with high conductivity, and deoxidising brass and bronze with magnesium.

British Insulated and Helsby Cables, Ltd., Prescot.—New pamphlet (No. P76), in which they show and describe the Prescot ticket punch (Mallins' patent), 1,400 of which are in daily use on the Liverpool Corporation tramway system.

Liquidations. — Joseph Richmond & Co., Ltd., Kirby Street, Hatton Garden, London.—August 27th is the last day for the receipt of proofs for intended dividend by Mr. R. J. Ward, the liquidator, at 2, Clement's Inn, W.C.

Pantelegraphy Publishing Co., Ltd. — This company is winding up voluntarily, with Mr. J. B. Wandless, 13, Old Jewry Chambers, E.C., as liquidator. A meeting of creditors will be held on August 14th.

Sir Hiram Maxim Electrical and Engineering Co., Ltd.—Mr. Arthur F. Whinney, the liquidator, is applying to the Board of Trade for his release. In a circular in which this is announced, it is stated that the whole of the company's property was taken possession of by the Receiver for the debenture-holders, and has not realised sufficient to meet their claims.

Fire.—The fire which occurred on Friday morning last at the premises of Messrs. Wenham & Waters, Paragon Works, Croydon, damaged only a portion of the shops. The works were reopened on Monday, and temporary arrangements have been made to prevent delays in execution of orders during rebuilding operations.

Book Notices.—*L'Annuaire International de l'Acetylène pour* 1908. Edited by R. Granjon and P. Rosenberg. Paris: Office Central de l'Acetylène. Price 2 fr.—This publication is in its second year, and now comprises 18 chapters, occupying nearly 300 pages. The bulk of the work, of course, relates to acetylene and its uses, but in the second chapter particulars are given of the carbide factories of the world, from which we gather that these are some 70 in number, having a total annual production of 180,000 tons, and employing a hydro-electric power of 250,000 h.p.; more than 6,000 employés are dependent upon the industry, and the annual sales from the works amount to 55 million fr. The average price per 100 kg. (about 2 cwt.) is in France from 37 to 43 fr.; in Germany, 30 to 35; in Austria, 32 to 38; in the United States, 37 to 45; in England, 35 to 40; and in Switzerland, 30 fr. Great Britain is credited with three factories (two of which are in Ireland!); there are 12 in France, 10 in Switzerland, and nine each in Spain and Italy. The Irish works are at Askeaton (200 h.p.) and Collooney (600 h.p.), the solitary English example being that of the British Carbide Factories at Thornhill (2,500 h.p.)

Die Korpuskulartheorie der Materie. By Dr. J. J. Thomson. Translated by G. Siebert. Brunswick: Fr. Vieweg & Sohn. 1908. Price M. 5.—This is the authorised translation of Prof. Thomson's classic work, which we reviewed at some length in October last. It forms the 25th part of the series "Die Wissenschaft," which is in course of publication by the well-known firm of Vieweg & Sohn, and which includes, as its third volume, Prof. Thomson's "Electricity and Matter." A glance through the list of works forming this admirable series shows that our distinguished author is in company worthy of that honour, such names as Curie, Werner, Kobold, Fischer and Rutherford being found amongst them. The merits of the work itself need no reiteration; the book is well-printed in Roman type, on good paper, uncut.

"High Speed Dynamo-Electric Machinery." By H. M. Hobart and A. G. Ellis. New York: John Wiley & Sons. London: Chapman & Hall. 1908. Price 25s. 6d. net.

"Journal of the Western Society of Engineers." Vol. XIII. June, 1908. No. 3. Chicago: The Society. Price 50 c.

"Proceedings of the American Society of Mechanical Engineers." June, 1908; Vol. 30, No. 6. Baltimore, U.S.A.: The Society. Price $1.

Messrs. Crosby Lockwood & Son send us the first number of a quarterly circular of Engineering and Technical Literature (classified under subjects) published at their recently opened Technical Book Room at 121A, Victoria Street, S.W. The circular contains all the most important works in engineering, science and technology published during the past three months in England and America, and as it will be repeated every quarter, should prove of great assistance to British engineers.

We have received a copy of No. 2 of *The Electron*, the monthly organ of Siemens's Stafford Institute. It contains much interesting matter, but one contribution in particular suggests that the editor is short of good copy. A paper by Mr. M. Schenkel on "The S.S.W. Single-phase Series Motor" is reprinted, with the discussion on it; an article on "Siemens—the Firm and the Family" is commenced; and a debate that took place some months ago on "Home Rule for Ireland" is reported.

Trade Announcements. — Mr. James Turnbull announces that after 8½ years he has severed his connection with the British Westinghouse Electric and Manufacturing Co., Ltd., as an engineer. He has opened an office at 3, New Street, Birmingham, where he will undertake general work.

The connection hitherto existing between Messrs. Schiff & Co. and Messrs. H. G. Mayer & Co. has been dissolved by mutual consent. All communications for Messrs. Schiff should be sent to them direct, 67, Aldersgate Street, London, E.C., where the business will be continued by them. The firm in England will shortly be known as "Ship Carbons," Ltd.

Messrs. E. P. Allam & Co., 11, Red Lion Street, Clerkenwell Road, E.C., announce that owing to increased demand for their Premier motor-starting switches and other manufactures, they have formed the Premier Electric Control, Ltd., as a private limited liability company, to take over as a going concern their entire manufacturing business. All liabilities up to July 31st will be met by them. The firm's electrical contracting department will continue to be conducted by Mr. E. P. Allam under the title of E. P. Allam & Co.

Bankruptcy Proceedings.—T. C. Hodgkinson, 186, Goldhawk Road, Shepherd's Bush, trading as the "Electric Neurotone."—This application for an order of discharge came before Mr. Registrar Hope last week at the London Bankruptcy Court. According to the report of Mr. G. W. Chapman, official receiver, the only offence was the insufficiency of assets to pay 10s. in the £ to the unsecured creditors. His Honour granted an order of discharge upon the bankrupt consenting to a judgment for £20.

Alfred William Bennett, residing at 43, Elford Grove, Leeds, and lately carrying on business at 32, Park Cross Street, Leeds, under the style of "Bennett & Co.," electrical engineers.—The above debtor, whose public examination in bankruptcy was adjourned a few weeks ago, again appeared at the County Court House, Leeds, on Tuesday. Mr. H. C. Bowling, who appeared for the Official Receiver, stated that the examination had been adjourned to give the debtor an opportunity of showing a liability to some trust monies which he had had. Debtor had amended his statement, which was now worse to the extent of £700 than it was formerly. The examination was closed.

Our correspondent at Cape Town writes:—"Amongst the insolvencies recently declared in Cape Colony are those of Mr. F. D. Lingwood, electrical engineer and poultry farmer, of East London, and Mr. Wm. Chas. Thomson, of Cape Town, importer of electrical supplies. Mr. Lingwood also acted as inspector of electrical installations for the Frontier Association of Fire Insurance Companies, his district comprising East London, King William's Town, Queen's Town, Aliwal North, &c."

LIGHTING and POWER NOTES.

Bangor.—The T.C. has applied to the L.G.B. for a loan of £2,000 for slot-meter fittings, mains, &c.

The mains are to be extended to Penrhyn Hall, on the trustees guaranteeing an annual consumption of 250 units at 5d. per unit for two years.

Cambridge.—The recommendation that the Fulbourn Asylum should be electrically lighted, which was agreed to by the Ely and Cambs. County Councils, has been declined by the T.C., which has appointed a special committee to report on the matter.

Clevedon.—The U.D.C. has decided not to apply to the B. of T. for a prov. order for E.L.

Continental Notes.—GERMANY.—The municipal central electric lighting station in the town of Posen is about to be extended at a cost of £75,000.

FRANCE.—Owing to a strike of the employés at a generating station, Paris was plunged into darkness for about 1½ hours on the evening of the 6th. It is stated that the companies agreed to the demands of the men, and so saved a repetition of the lengthy strike of last year.

Darlington.—The T.C. is to reduce the price of electricity for lighting to 3½d. per unit.

Dartford.—The Board of Trade has informed the R.D.C. that it has decided to defer for six months the consideration of the question of revoking the Strood and Dartford (Rural District) Electric Light Order, 1903.

Derby.—A L.G.B. inquiry was held on August 4th into the application of the T.C. for a loan of £7,500 for electricity purposes, £5,750 for mains and services, and the balance for motors, radiators and transformers. There was no opposition.

Dublin.—The Lighting Committee of the Corporation has recommended that a loan be applied for in connection with the further extension of the electric lighting plant, to be embodied in a general application of a loan of £10,000.

Dundee.—At a recent meeting of the T.C., Mr. William Forwell raised a question regarding the payment to Messrs. Willans and Robinson, of £7,500, equal to about 40 per cent. of the contract price for the turbines and auxiliary machinery for the new power station. He explained that the construction of the building was two months behind, and he did not think the Council should pay away this money without in some way recouping themselves for the loss of interest, &c. The matter was remitted back to the Electricity Committee.

Glasgow.—The annual report of the Corporation electricity undertaking shows that the gross revenue for the year ended May 31st last, amounted to £253,402, and that the expenditure was £115,317. Out of the revenue the following had to be met, namely:—Interest, £54,715; and sinking fund, £32,308; leaving a balance on the year's working of £51,061, compared with £44,824 in the previous year. From the balance it is proposed to deduct £50,151 depreciation, written off capital account, leaving a surplus of £910. It is recommended that for the year from June 1st, 1908, to May 31st, 1909, the rebate price for private lighting purposes, that is, for shops, warehouses, offices, theatres, halls, and places of entertainment, should be reduced from 1d. to ¾d. per unit. To domestic consumers, who have hitherto been charged at a uniform rate of 3½d. per unit, it was now proposed to charge 3d. per unit. The report states that the quantity of electricity sold to private consumers during the year was 31,087,322 units; the number of consumers was 16,926; the motors supplied numbered 3,853, with a total horse-power of 23,748. The number of arc lamps in regular use in the streets was 837, the same as last year, and the quantity of electricity consumed for street and stair lighting was 1,707,485 units. There were 1,551,997 8-C P. lamps, or the equivalent in other devices, connected to the mains, being an increase of 147,444. The maximum load during the year was 22,186 KW., as compared with 19,646 KW. in 1906-7.

Greenock.—The balance-sheet for the year's working has been approved by the T.C.'s Electrical Committee. After paying interest and setting aside the amount due for sinking fund, &c., the surplus on the year's working was shown to be about £700. It was pointed out that during the year the loss on the distribution of current was 9·5 per cent., compared with 2·8 per cent. in 1905, and the engineer explained that part of the loss was due to a supply not having been metered at the new works, and to the new crane at the refuse destructor.

Hertford.—The T.C. has accepted the offer of the North Metropolitan Electrical Power Distribution Co., Ltd., to provide and light nine arc lamps at £14 10s. per lamp per annum, less 5 per cent. discount, for five years.

India.—In connection with the proposals for the electrification of the Nilgiri Mountain Railway, it is also proposed to light Ootacamund, Coonoor and Wellington by electricity. The additional cost for lighting Ooty is estimated at Rs. 1,30,000.

The Municipal Commissioners of Mussoorie have applied for a licence under the Indian Electricity Act in respect of the area comprised within the municipal limits.—*Indian and Eastern Engineer.*

Kirkby-in-Ashfield.—The U.D.C. has decided to take no further steps towards effecting a renewal of the E.L. Order, 1903, or a postponement of its revocation.

Motherwell.—The returns of the electrical department for the year ending May last, shows that some 1,964,683 units were sold, as compared with 1,527,299 units in the preceding year, the works cost falling from 69d. to 65d. during the period. The total revenue amounted to £12,039, the working expenditure was £6,073, and after meeting the usual financial charges, there remained a net profit of £859, which it has been agreed to apply towards the reduction of expenditure on free wiring, paying off legal charges, &c. During the year a boiler, steam dynamo, together with pumps, piping, switchgear, &c., has been brought into use.

Rossendale.—While the work of relaying the Haslingden tramways is proceeding satisfactorily, there are difficulties in the way of electrical working. The generation of electricity by Haslingden for tramway purposes appears to be almost an impossibility, seeing that it is expressly forbidden by a clause of the Haslingden Corporation Act of 1906. According to its Act the Corporation may put down equipment for electric tramways, with the important exception of a generating station. In face of this it is surprising that a decision should have been come to, to erect a generating station in connection with the refuse destructor at Prinney Hill. The Haslingden T.C. has effected an arrangement with the Accrington Corporation for a supply of cars and current during a period of nine months. This, however, does not go far enough to satisfy public requirements, seeing that it only applies to the section between the Commercial Hotel and the Baxenden boundary.

The Rawtenstall authorities have a scheme of their own, and there remains the question of the purchase of current from Rawtenstall for the working of the Lockgate to the Commercial section. At the Rawtenstall conference the Mayor of Haslingden held that it had been previously agreed that Accrington and Haslingden should jointly run the tramways between Accrington and Rawtenstall. This, however, was denied on behalf of Rawtenstall, and Haslingden's representatives then said they were not prepared to go further into the matter.

Further interest is lent to the question by a long statement just issued by Alderman J. H. Maden, Mayor of Bacup, in which he states that the interests of the whole of the ratepayers in the three boroughs would be best served by each Corporation taking a bulk supply from the power company. The Bacup Corporation is a large ratepayer in the borough of Rawtenstall, and its interest as such will shortly become much larger, owing to the completion of a water undertaking, about half of which is within that borough. The Bacup Corporation objects most strongly to the spending of capital which will be required for a separate generating station for Rawtenstall. Failing a supply from the power company, the Bacup Corporation is of opinion that a municipal supply should be generated at one station, controlled by a body representing all three boroughs. The B. of T. has placed a time limit, September next, to the Bacup Electric Lighting Order, and the Bacup Corporation desires to come to an arrangement, as it may consider it advisable to make application for sanction to a loan for a separate gas-driven station for Bacup alone.

Rotherham.—The L.G.B. has sanctioned the borrowing of the sum of £3,820 by the Corporation for the provision of a turbo-generator and condensing plant at the electrical station. The Board made certain observations with regard to the money proposed to be borrowed for "spare parts," and it has been decided that this expenditure be paid out of the renewals fund.

The Corporation has decided in favour of combining the proposed destructor plant with the electricity works; the engineer reports that the refuse should have a fuel value of some £1,000 per annum.

Salford.—A L.G.B. inquiry has been held into the application of the T.C. for sanction to borrow £15,281 for the supply and erection of a cooling plant and other work in connection with the electricity undertaking.

St. Anne's-on-the Sea.—The U.D.C. has received from the L.G.B. sanction to a loan of £3,500 for the extension of the mains, &c.

South Africa.—Some particulars of the new Brakpan generating station of the Victoria Falls Co., were given in a recent issue of *African Engineering*. The building is a steel-framed brick building containing two 3,000-KW. turbo-alternators, generating three-phase alternating current at 10,000 volts pressure, which will be stepped up to 40,000 volts for transmission. The boiler house contains ten 1,500-H.P. Babcock & Wilcox boilers, with economisers, coal bunkers and conveying plant, &c. A separate bay is provided for the transformers and switchgear, and the latter will be controlled electrically from a switchroom.

Stalybridge.—The Stalybridge, Hyde, Dukinfield and Mossley Tramways and Electricity Board has received from the L.G.B. sanction to loans of £22,178 for electricity purposes.

Thirsk.—The T.C. has accepted the tender of the E.L. Co. for public lighting for three years at £205 per annum.

Torquay.—The T.C. has decided that the following charges be made to consumers of energy for power whose demand is continuous for at least eight hours per day on an average throughout the year:—For each KW. demand for a motor, for the first 200 units per annum, 2d. per unit; for the next 100, 1½d.; beyond, 1½d.

TRAMWAY and RAILWAY NOTES.

Australia.—ADELAIDE.—The first annual report of the engineer of the Tramways Trust has been published. During the year contracts to the value of £319,863 have been let, and plans and specifications issued for further works of the value of £137,000. Plans are now being prepared for the power station; it is expected that the North Adelaide line will be opened before the end of the year.

Brighton.—The question of reviving the disused horse tramway route from the Hove boundary to Shoreham, and operating it electrically, is being considered.

Canada.—The province of Ontario has 650 miles of electric railway. Of this mileage only 57 miles is operated by electricity generated by water power in the operating companies' own power houses, notwithstanding the fact that there is so much said of the great water powers of the province, not excepting Niagara. Eighty-eight miles of road is operated by rented electricity.

Ottawa-Brockville Railway.—The first trunk line of electric railway, in which electricity will supersede steam, is expected to become a reality next summer. This is a new line from Ottawa to Brockville on the St. Lawrence. Mr. C. P. Stuart Morgan, of Bristol, England, a capitalist, is the leading shareholder and the active promoter of the proposed road. Work is expected to commence in September and the road may be completed early next summer. The road will cut off eighteen miles between Brockville and Ottawa, and give excellent accommodation to a wealthy farming community.

Continental Notes.—Switzerland.—A tramway tunnel, over a mile in length, has been opened by the Genoa Street Railway Co. for giving a direct route between Rivarolo and Genoa. Previously the tramway route, which passed round a mountain, was a mile and a half longer.

Norway.—H.M. Embassy at Christiania reports the opening of the first electric railway in Norway, from Thamshavn to Svorkmo, a distance of about 20 miles. The power station is some six miles from Thamshavn and the power is generated by a waterfall 58 metres high, developing 3,000 H.P., and driving five turbines representing the same amount. The railway is said to be the only one in Europe worked on this system. In addition to passengers, the railway will carry copper ore from the Meldal mines, the owners of which are also the proprietors of the railway.—*Board of Trade Journal.*

France.—An electric tramway is to be constructed between Cagnes and Grasse, in the Maritimes Alps.

Austria.—A Commission of the Vienna Ministry of Commerce and Post Office has been investigating a proposal from the Siemens-Schuckert Works for the construction of an electrical underground railway, linking together all the railway stations and post offices in Vienna. Trains would carry letters, newspapers and parcels through this subway at the rate of 32 km. an hour, and the cellars of the post offices could be enlarged and used as stations. It is said that the project, which at first was regarded as quite impracticable, is now viewed much more favourably. Investigations from the technical side show that there are no very great difficulties in the way. Financially, too, there seem to be no very great obstacles, as the promoting firm is willing to build and equip the line entirely at its own cost, allowing the State to extinguish the debt by moderate annual payments.—*Financier.*

Dundee.—The T.C. has had a long discussion on the proposed adoption of the trackless trolley system. It was agreed to inform the B. of T. that it is proposed to adopt the system on a circular route.

Eastbourne.—The working of the Corporation motor-'buses (16 in number) for the year 1907-8, shows a profit (on paper) of £560. The latter sum was placed to the depreciation fund.

Glasgow.—A proposal has been made that the Tramways Committee should erect notice boards at the various tramway termini giving the time at which the last car departed. The Committee, however, has declined to entertain the proposal.

The T.C.'s Committee has recommended that the contribution from the surplus revenue of the tramways department to the Common Good fund of the city be £50,000 this year, instead of £35,000 as previously recommended.

An application by the London Electrobus Co., Ltd., for a licence to open a service of electric omnibuses on suitable routes in the city has been before the Magistrates' Committee of the T.C., and the matter has been remitted to a sub-committee.

Hastings.—Notwithstanding a resolution passed by the B.C., the operating company is maintaining its usual Sunday service, which it is claimed was sanctioned by a ratepayers' poll.

The B.C. is considering the extension of the tramway system to the Old Town.

Leeds—Bradford.—An agreement as to an experimental through service between Leeds and Bradford was to come before the latter city's Council for adoption this week. The working expenses will be based on the ascertained figures of the two concerns; each undertaking will take its own local receipts, and through fares will be divided equally up to an agreed number, above which the ratio of the mileage traversed on each system will form the basis of division. It will be remembered that this route is built on two gauges, 4 ft. and 4 ft. 8½ in. respectively, and that the through cars are fitted with an adjustable truck of novel design.

Manchester.—The cost to the Tramways Department arising out of compensation claims for personal injury amounted, during the past financial year, to £15,356, against £8,000 in 1906. The increase has given rise to a good deal of concern on the part of the authorities, and the Chairman of the Tramways Committee, Alderman Bowes, stated at a recent meeting that it might become necessary to insure against these claims.

A deputation, including representatives of the Tramways and Permanent Way Sub-Committees, with the general manager, left Manchester on Saturday for Berlin, to study the operation of trackless trolley systems.

New York.—Two experimental eight-car trains with side doors at the ends, are to be put into operation in the subway by the Interborough Rapid Transit Co.; the present cars have the doors in the middle, an arrangement which is said to cause much delay. The entire reconstruction of the subway equipment will cost some $1,500,000.

Oxford.—It is stated that an application will shortly be made by the Electric Vehicle Co., Ltd., for permission to place a number of electrical omnibuses on the streets. A trial vehicle has been running in the streets for the convenience of members of the T.C.

Portsmouth.—For the year ended March last, 21,247,048 passengers were carried on the Corporation tramways, an increase of half-a-million on the year 1906-7. The total income amounted to £99,341, and the gross profit to £51,325, both totals being less than in the preceding year. After meeting financial charges, a balance remained of £13,132, which provided, among other items, for £2,500 placed to reserve, and £9,351 to renewals. The tramways power station generated some 2,500,000 units at a working cost of ·601d. per unit, interest, sinking fund, &c., bringing this up to ·973d. per unit. The energy used per car-mile was ·99 unit. During the year a new 1,000-KW. generating unit with condensing plant has been in full use, and has to some extent neutralised the increased cost of coal. The total revenue per car-mile was 10·32d., and the working expenses per car-mile amounted to 4·98d.

Salford.—The Corporation tramways earned last year a gross profit of £92,277, with £4,486 added for interest on investments, &c. These sums together, make £96,763, which is dealt with as follows:—Payments to local authorities for running powers, &c., £25,893; interest and sinking fund charges, £41,970; repairs, &c., £92; contribution to the borough fund in relief of rates, £18,000; depreciation and renewals fund, £10,806; total, £96,762. Since the commencement of the undertaking, there has been a net profit of £131,835, and £79,000 has been contributed in relief of the local rates, whilst £58,307 has been placed to depreciation and renewals fund. The length of tramways now under the control of the Salford Corporation is 75 miles. The average consumption of energy last year was 1·58 units per car-mile, and the year's traffic shows an increase in the gross receipts of £6,947. The average receipts per car-mile, however, are slightly less than in the previous year, for which wet weather is largely accountable. The number of passengers carried last year was 45,771,611, as compared with 28,150,675 in 1903; the receipts £238,856, against £144,486 in 1903; and the earnings per car-mile 10·44, against 10·25.

Wallasey.—The total receipts from the Council's tramways during the year 1907-8 amounted to £43,824, and the gross balance to £17,174. After meeting interest and sinking fund charges, and providing £4,000 for depreciation, £1,000 for insurance, £4,340 in aid of the rates and other items, a balance of £26 remained for carrying forward. The total of the reserve fund amounts to some £16,800, and over £15,000 has been applied in aid of the rates up to date.

TELEGRAPH and TELEPHONE NOTES.

Breakage of Insulators.—Prosecuting a youth at Northwich on Tuesday for shooting at telephone insulators with a catapult, Mr. Vaughan, a Post Office engineer, stated that the replacement of broken insulators cost £1,000 a year. Forty insulators had been smashed in a fortnight on a new line between Northwich and Manchester, and on one day 50 insulators were broken in a single township.

Bureau International.—In conformity with a decision of the Telegraph Conference recently held at Lisbon, the Bureau will in future be known as the Bureau International de l'Union Télégraphique.

Overhead Wires in the City.—Last year, 27 derelict and unidentified wires, 546 yards long, were removed. A large number of disused wires and attachments was also taken down. There are now 155 owners of lines in the City. A total of 733,200 spans of wire cross the public thoroughfares. There has been a net increase of 1,211 miles of National Telephone Co.'s wires. The tendency of that company is to take down their open wires and small cables and substitute heavy cables, the larger of which contain as many as 368 wires, the number of wires thus increasing in a greater ratio than the spans. Although the exchange telephone systems of the Post Office and the company have been greatly extended, there is a constant addition to the number of private "direct" lines. The necessity of an immediate connection for business purposes is one cause of this increase, and there is nothing to prevent such lines being erected. Last year 2,797 complaints of broken wires and other contraventions of the by-laws were made and rectified.—*The Times.*

Public Time Service.—The British Science Guild has issued a report on the synchronisation of clocks in London, and in Great Britain generally, in which it is recommended that a clock in each public post office should be automatically set to standard time, instead of trusting to hand correction, as at present. It is proposed also to urge the London County Council, the Corporation of London, the railway companies and Government departments to have all their public clocks synchronised, and to ask the L.G.B. to secure the passing of a by-law requiring all persons exhibiting clocks to have them synchronised—or removed. Steps are being taken to carry out these recommendations. The existing state of things in this connection is simply chaotic; hardly any public clock can be trusted, and it is a curious fact, though perhaps not a matter for wonder, that the clocks exhibited by professing clock and watchmakers are very frequently the worst offenders.

Sale of Cable.—According to the *Telegraph Age*, the submarine cable between Nantucket and Martha's Vineyard has been sold by the United States Government to the Martha's Vineyard Telegraph Co.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra } Closed .. Curacao-Maracaibo	Jan. 12, 1906 ..	..
Tarifa-Tangier	Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)	Mar. 9, 1904 ..	..
Las Palmas—Arrecife	May 18, 1908 ..	..
Pera-Dardanelles	May 20, 1908 ..	..
Sierra Leone-Accra	May 28, 1908 ..	..
Cadiz-Tangier	June 3, 1908 ..	Aug. 8, 1908.
Kwandang-Menado	Aug. 5, 1908 ..	..
Cotonou-Grand Bassam	July 20, 1908 ..	Aug. 4, 1908.
Djedda-Souakim	July 27, 1908 ..	..
Assab-Massouah	July 28, 1908 ..	..
Trinidad-Demerara	Aug. 1, 1908 ..	Aug. 9, 1908.

The telegraph line between Novokiewsk and Huntschun (Wenchuen) in the province of Kirin, China, has been re-opened for public traffic.

Telephone Infection.—Writing to the *Times* of Wednesday last, Mr. R. S. Dean points out that a very simple and efficient cover can be applied to the mouthpiece of a telephone transmitter by fitting to it a piece of thin, tough paper, and securing it in position with a rubber band.

Wireless Telegraphy.—The Bureau International at Berne notifies that the next annex to the Official Nomenclature of Telegraph Offices of the World will also contain a list of coastal wireless stations, as well as those on board ship. The publication will be issued on the 1st proximo. The Bureau will also issue a special nomenclature of such offices, as most of the adherents to the "Wireless Convention" have furnished them with the necessary particulars as to the wireless stations operating on their territory.

The United Wireless Telegraph Co. has opened a commercial station at Friday Harbour, Washington, which is in communication with Seattle and other points on the Pacific Coast. It is also stated by the *Telegraph Age* that the United Wireless Telegraph Co. has taken over the International Wireless Co., and will control the patents and rights held by that company. The United Wireless Telegraph Co. intends to establish 11 new stations for the Pacific service. The most powerful will be established at Ketchikan, in Alaska.

Wireless telegraph stations have been opened at Tangier, Rabat, and Casa Blanca, in Morocco.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Perth.—October 6th. The Postmaster-General requires tenders for various telegraph and telephone material. Particulars may be obtained at the Commonwealth Offices, 72, Victoria Street, Westminster, S.W.

Tasmania.—November 2nd. The Postmaster-General requires tenders for material for accumulators and equipment for telegraph purposes.

Belgium.—Antwerp.—August 31st. Four electric capstans on the quays of the Royers Lock, at Antwerp. Deposit of 5,000 francs (about £200) to qualify. Tenders to M. le Bourgmestre de la Ville d'Anvers, Hôtel de Ville, Antwerp. The specification (Cahier des Charges) may be obtained from the Hôtel de Ville, at a cost of 0·50 franc. A copy may be consulted by British contractors on application at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Bolton.—August 27th. The Electricity Committee invites tenders for the supply of 25,000 tons of bituminous engine slack to be delivered at the electricity works, Spa Road.

Bulgaria.—Sophia.—August 29th. Fresh tenders are being invited by the municipal authorities of Sophia for the establishment of a central electric lighting station in the town.

Sophia.—August 29th. The tenders for the erection and equipment of a central station to work the Government mines at Pernik have been modified, and the time has been postponed to August 29th. Intending tenderers must show that they have already carried out similar undertakings, and must deposit £1,200 with the National Bank of Bulgaria.

Edmonton.—August 26th. Electric lighting installation at the Nurses' Home for the Guardians. See "Official Notices" July 31st.

Farnworth.—August 27th. Motor-generators, rotor converters, switchgear, transformers, &c., for the U.D.C. See "Official Notices" to-day.

Galashiels.—The T.C. will receive tenders on contract No. 2 of their sewerage scheme for the following:—The providing and erection of sewage distributors, gas producer plant, dynamos, motors, pumps, &c. Specifications, &c., from Mr. W. A. Baird Laing, A.M.I.C.E., 175, Hope Street, Glasgow, up to August 24th.

Germany.—The municipal authorities of Cologne are about to invite tenders for the supply of four 3,000-H.P. steam turbines for the central electric lighting station.

Holland.—Amsterdam.—August 19th. The Direction de la Marine requires tenders for electric lighting material and apparatus, and for cables, by August 19th.

Hull.—August 26th. Pipework for the Electricity Department. See "Official Notices" to-day.

London.—September 7th. General Post Office. The Postmaster-General invites tenders for the supply of telegraph poles of (*a*) home-grown larch or fir, and (*b*) Swedish, Norwegian, Finland, or Russian red fir, to be felled during the winter of 1908-9, and to be delivered during the following summer. Particulars from Mr. G. Morgan, Controller of Stores, Stores Department, G.P.O., 17-19, Bedford Street, London, W.C.

Metropolitan Asylums Board.—September 1st. Storage battery, booster, switchboard, &c., for the training ship *Exmouth*. See "Official Notices" July 31st.

L.C.C.—September 8th. Cables, cable boxes, &c., for East Greenwich generating station and Woolwich Road car depôt; electric wiring for car depôt; switchgear; and six 500-KW. and one 150-KW. motor-generators, for the L.C.C. See "Official Notices" August 7th.

Paris.—August 20th. The Central Administration of the Materiel and Military Telegraphs, 51 bis, Rue de Latour Maubourg, requires tenders for 100 Morse apparatus, 100 optical apparatus, and 2,500 kilogrammes of special bronze wire of $\frac{8}{10}$ mm. diameter. Tenders by August 20th.

Rawtenstall.—August 15th. Sixteen tramcars, and station lighting, wiring, instruments, &c., for the Corporation. See "Official Notices" July 31st.

Reigate.—August 20th. Surface condensing plant with cooling tower, &c., for the T.C. See "Official Notices" August 7th.

Russia.—September 14th. The Town Clerk of Odessa (Upiawa) requires tenders for a concession to erect and work a power and lighting supply. A central station of a minimum of 6,000 H.P. is to be erected and equipped.

Spain.—September 25th.—The Spanish Ministry of Public Works is inviting tenders for the concession for the construction and working of an electric tramway in Madrid between La Glorreta de Alonso Martinez and Chamartin de la Rosa.

The municipal authorities of Pradoluengo (province of Burgos) have just invited tenders for the concession for the electric lighting of the town.

The municipal authorities of Santuree Ortuella (province of Vizcaya) have just invited tenders for the concession for the electric lighting of the town.

Watford.—September 1st. Surface condenser and pumps for the U.D.C. See "Official Notices" July 31st.

CLOSED.

Australia.—Brisbane.—Postmaster-General. Five tons sulphate of magnesia for batteries, £6 2s. 6d. per ton; 1,000 carporous pots No. 1, 2s. 7d. each; 3,000 ditto No. 2, 1s. 10d. each; 20 gross connecting screws, £1 7s. 6d. per gross.—Brisbane Electrical Co. Two tons sal ammoniac, £39 17s. 3d. per ton; 20 gross connecting screws, £1 7s. 6d. per gross.—Trackson Bros. Three miles gutta-percha-covered wire, £16 per mile.—W. T. Henley's Telegraph Works, Ltd. 16 tons sheet zinc, £26 2s. 5d. per ton.—G. Willis and Co. 6,000 No. 2 Leclanché zincs, $2\frac{7}{16}$d. each; 1,000 No. 1 ditto, $2\frac{2}{3}$d. each.—British Insulated and Helsby Cables, Ltd.

Melbourne.—Postmaster-General. 300 counters for switchboards, 7s. 3d. each.—India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd. Three cable wagons, £16 5s. each; 240 posts, 3s. 9d. each; 400 rails, 2s. $4\frac{1}{2}$d. each; four closets, 3s. 5d. each.—Weaver Bros. 125 ordinary telephone translators, multiplex, at 12s. each; 100 telephone attendants' head and breast telephone sets, £1 16s. each.—J. Bartsam & Son. One mile of 50-pair silk and cotton-insulated telephone switchboard cable, £190; and one mile of 100-pair silk and cotton-insulated switchboard cable, £365.—British Insulated and Helsby Cables, Ltd.

Auckland (N.Z.).—The City Council has accepted the tender of Messrs. Turnbull & Jones, for a new electric generator, &c., at £2,259.

Belfast.—Messrs. Thermit, Ltd., have received an order for one of Mattinson's patent rail grinders for the Corporation tramways.

Bolton.—The Corporation has accepted the tender of the Triumph Stoker, Ltd., of Leeds, to supply six patent Triumph stokers to the electricity works, to replace coking stokers now in use. This is the sixth repeat order from the same Corporation.

Burnley.—The T.C. has accepted the tender of Messrs. Dick, Kerr & Co., Ltd., for a 750-KW. steam generating set, at £3,925, and that of Messrs. Mullin & Durkin for the erection of a boiler house and chimney at the electricity works, at £3,258.

Glasgow.—The T.C.'s Sub-Committee on Tramways, Works and Stores recommend the acceptance of the following tenders:—

Spare sprocket wheels.—British Westinghouse Co.
Commutators.—Forest City Electric Co.
Weighing machines.—W. & T. Avery, Ltd.
Insulators.—Loudon & Clark.
Cast-iron pipes.—R. Laidlaw & Son.
Traction poles.—Wilsons & Union Tube Co.
Steel rails.—Lorain Steel Co.
Traction lamps.—Electrical Co.
Motor gear cases.—British Westinghouse Co.
Three-core ·2 sq. in. lead-covered cable.—British Insulated and Helsby Cables, Ltd.
Special trackwork at Bilsland Drive, &c.—Hadfield's Steel Foundry Co.

London.—The contract for the electric lift work for Nos. 9 & 10, Marble Arch, has been placed with the Titan Lift and Electric Co. The passenger lift is of the push-button type, to serve seven floors.

Manchester.—Messrs. Ward & Goldstone, of Salford, have received a contract for the supply of wires and cables for the Manchester Electrical Exhibition. Messrs. Lomax Kendals are the contractors.

Rawtenstall.—Messrs. Thermit, Ltd., have received the order for welding the rails for the Corporation tramways; the work to be carried out by them, as sub-contractors to Messrs. Underwood & Bro., Dukinfield, who are the contractors for the permanent way.

Rotherham.—The T.C. has accepted the tender of the Worthington Pump Co. for an electrically-driven pump, at £283.

Salford.—The T.C. has accepted the tender of the Blasberg Engineering Co., at £11,457, for the supply and erection of a water cooling plant; also the tender of Waring & Gillow, Ltd., at £344, for rewiring a portion of the Royal Technical Institute.

Walsall.—The T.C. Electricity Committee has decided to purchase a 3-in. Venturi water meter from Messrs. George Kent, Ltd., for measuring water from the canal in connection with new condensing plant, at a cost of £70.

Wimbledon.—An offer of the British Electric Transformer Co., Ltd., to supply two 50-KW. transformers in exchange for five disused transformers and the payment by the Council of £66, has been accepted.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Two houses in Louisville Avenue, for Storie, Cruden and Simpson; Cameron & Watt, architects. Store in Catton Street, for Kemp, Walker & Co., millers. Additions to 8, Hamilton Place, for Rev. J. Mann. Machine shop in Ocean Row, for W. Slater and Sons, fish-curers; D. and J. R. M'Millan, architects. Store at Albert Quay, for R. Irvin & Sons, Ltd.; Kelly & Nicol, architects.

ABERYSWYTH.—Welsh Calvinistic Methodist Chapel in Bow Street, in connection with Garn Church.

ASCOT.—New Parish Room in connection with All Souls' Church, South Ascot (£850).

ASPULL (LANCS.).—New mortuary for the District Council. F. T. Powell, contractor.

BACUP.—Elementary school in the Weir district (£6,000). Town Council.

BAGWORTH (LEICESTER).—Forty houses for the New Bagworth Coal Co., Ltd. J. Povey-Harper, architect, All Saints' Chambers, Derby.

BARNSLEY.—Alterations and extensions at the Beckett Hospital. R. and W. Dixon, architects, Eastgate, Barnsley.

BARROW-IN-FURNESS.—Important extensions contemplated. Kellner and Partington Pulp Co., Ltd.

BELFAST.—Pair of semi-detached villas in Ravenhill Road, for W. E. Bourke, Rosemary Street, Belfast, and villa in Donegall Road; J. F. M'Cann, architect, 102, Donegall Street, Belfast; probable re-building, after fire, of printing establishment of J. W. Boyd, North Street.

BIRKDALE.—Additions to Wesleyan Chapel, Liverpool Road South, for the Trustees; workshop, Station Road, Ainsdale, for J. Ward and Son; four houses, Cardigan Road, for C. E. Howarth; 10 houses, Mill Lane, Ainsdale, for J. Cope; house, Hatfield Road, Ainsdale, for Campbell & Fairhurst.

BIRKENHEAD.—Extensions to the Nurses' Home at the Workhouse, for the B.G. E. Kirby & Sons, architects, 5, Cook Street, Liverpool.

BIRSTALL.—Sixteen houses for the Birstall Co-operative Society. R. Worcester, architect, Balloon Street, Manchester.

BLACKBURN.—Houses, Lincoln Street, for C. E. Townley; Cromer Place, for H. Thompson; Franklin Street, for J. Highton & Son, builders, Bridgwater Street; Higher Croft Road, for the National Free Homes Association, Ltd.

BLACKWELL (DARLINGTON).—New chapel.

BLANTYRE.—Proposed new Hall. Mr. M'Anulty, Chairman of the Committee.

BOGNOR.—Re-modelling the Pier (£10,000).

BOLTON.—Additions to rope-works, George Arthur Street, J. Charnock; nine houses in Settle Street, for J. Dickinson.

BOURNEMOUTH.—Alterations at the Gordon Hotel, Southbourne; C. E. Hawker, architect. Extensive alterations to the Railway Hotel, Holdenhurst Road, for H. Cartwright.

BRADFORD.—Wool warehouse in Bolton Hall Road, Frizinghall; A. Sharp, architect, Market Street, Bradford. Villa residence in Park Road, Eccleshill; J. H. Bakes, architect, Calverley Chambers, Victoria Square, Leeds.

Extension to Eccleshill Baptist Sunday Schools.

BRANDON.—Twenty houses at Sleetburn.

BREDBURY (CHESHIRE).—Houses, Werneth Road, Woodley, for A. H. Barlow; Mill Lane, for Mr. Bridge; Guywood Road, Romiley, for Jas. Swindells.

BRISTOL.—Proposed electrical equipment of Welsh pits, for the Main Colliery Co., Marsh Street, Bristol.

BUXTON.—Alterations and additions to Heaton House, Fairfield, for H. E. Newbold. C. Flint, architect, 5, The Quadrant, Buxton.

CAMBORNE.—Houses, Mount Pleasant Road, for S. Haslett.

CAMBRIDGE.—Alteration to shop in Market Passage, for Shippey & Sons; A. Negus & Sons, builders, Regent Street, Cambridge. Alteration to house in Jesus Lane; Coulson & Loftus, builders, Cambridge. Alteration of shop in Regent Street, for the Belfast Linen Co.; A. Negus & Sons, builders, Regent Street, Cambridge. Additions to Kingfield, King's College, Cambridge, for the Provost and Fellows; W. Bell & Co., builders, Downing Street, Cambridge.

CARDIFF.—Houses on Parade, Whitchurch, Cardiff. Six houses, Hawthorn Road, Whitchurch; Thos. Evans, builder, Whitchurch. House, Market Street, Tongwynlais, Whitchurch; S. Shail, builder. Sixteen houses, Waentreoda Road, Whitchurch; C. H. Hockridge, builder, Whitchurch. Additions to house in Church Road, Whitchurch; Dr. Wayne Morgan, Whitchurch. Eight houses in Deri Road; T. C. Cloater, 10, Marlborough Road, Cardiff. Nine houses, Dynas Street; E. W. M. Corbett, architect, Cardiff. Additions to Eagle Brewery, Church Street; W. W. Nell, Ltd., Cardiff. Rebuilding premises for Cross Bros. in Church Street; Veall & Sant, architects, Cardiff. Two houses in Dynas Street; E. W. M. Corbett, architect, Cardiff. Six houses, Westville Road; W. H. Scott, architect, Cardiff. Bakehouse in Cowbridge Road for J. E. Cobb; Veall & Sant, architects, Cardiff. Motor shed at Windsor Place for Dr. Martin; W. James, architect, Cardiff. Alterations to business premises in Castle Street, Stranaghan & Stephens; Veall & Sant, architects, Cardiff. Two houses, Pencisely Road; Blacker Bros., Clive Road, Cardiff. Two houses, Tydraw Road; E. W. M. Corbett, architect, Cardiff.

CHIPPENHAM (WILTS).—Houses for H. C. Cook, and Corsham Road, for G. Ll. Palmer.

CHORLEY.—Houses, Cowling Brow, for J. W. Lee; Aniline Street, for A. Tromans.

CLACTON-ON-SEA.—Houses, Victory Road, for A. Taylor; Central Avenue, for G. Mills; Branston Road, for W. Parsons; Cemetery Road, Great Clacton, for Mrs. E. Simmons. New Reckitt Convalescent Home, Holland Road, for the Great Northern and Central Hospital, Holloway Road, London.

CHAPEL-EN-LE-FRITH.—Houses, Lower Crossings, for E. Mellor; Eccles Road, for N. Spencer.

CLAYTON (near BRADFORD).—Board room, Committee rooms, &c., at the Workhouse. J. Harper Bakes, architect, Calverley Chambers, Victoria Square, Leeds.

CLAYTON-LE-MOORS.—Fourteen houses, Whalley Road, for Jacob Calvert.

COALVILLE (LEICESTER).—Unitarian Hall, Bridge Road, for the Unitarian Trustees.

COLNE.—Public Library. Colne Corporation.

CORK.—Alterations to the South Charitable Infirmary and County Hospital. J. F. M'Mullen, architect, 30, South Mall, Cork.

CREWE.—Eight houses, Gainsborough Road, for Mrs. Wade; new Wesleyan Sunday Schools, for Trustees of Trinity Church.

CUCKFIELD.—Sewage disposal scheme (£10,000). Rural District Council.

CUDWORTH.—Four houses. W. T. Turner, architect, George Chambers, Market Hill, Barnsley.

DALZIEL (N.B.).—New offices in Brandon Street.

DERBY.—School in Kedlestone Road for the Derby Education Committee. C. B. Sherwin, architect, 16, St. James's Street, Derby.

DONERAILE (Co. CORK).—Sanatorium for Consumptives at Streamhill. W. H. Hill, 28, South Mall, Cork; and R. Evans, 53, South Mall, Cork, joint architects.

DORKING.—Alteration and enlargement of the National School (£600).

DUBLIN.—Theatre on site of old Queen's Theatre, Great Brunswick Street (to be electrically lighted throughout). R. J. Stirling, architect, 24, Clare Street, Dublin.

DUDLEY.—Bakery at Waddams Pool. Secretary, Co-operative Society, Waddams Pool, Dudley.

DUNDEE.—Alterations at the Albert Institute. J. Thomson, city architect, 91, Commercial Street, Dundee.

EBCHESTER (Co. DURHAM).—Proposed Primitive Methodist Church at Hamsterley Colliery.

ECCLES.—Proposed alterations at the Hare and Hounds Hotel, Church Street; further extensions at local sewage works (£1,500); borough engineer, Eccles, Manchester.

Fourteen houses in Corporation Road; borough engineer.

ELLESMERE PORT.—Church Institute in Station Road; Blakeley & Co., contractors, Liverpool. New library in Station Road for the Council.

FELLING (Co. DURHAM).—New workmen's club premises. H. Miller, architect, Felling.

FELLING (Co. DURHAM).—Enlargement of the Wardley Council School. H. Miller, architect, Council Buildings, Felling.

FROSTERLEY (Co. DURHAM).—New Institute at Weardale.

GOLBORNE (SOUTH LANCS.).—House and shop in Leigh Road. E. Wyatt.

GRAVESEND.—Repairs at the Technical Institute, for the Higher Education Sub-Committee. J. A. Stirton, Technical Institute, Gravesend.

HALIFAX.—Trimmingham Estate sold to C. H. Horner, Mile Cross, High Road, Wells, Halifax; electric light to be supplied. Conversion of 16, Silver Street, into bank premises, for the Halifax Equitable Bank; J. H. Mitchell. Conversion of house into shop, 40, King Cross Road; Arthur Coltingwood (electric light). Conversion of shop into dwelling-house, 30, Clover Hill Road; Rich. W. Evans.

HARROGATE.—Municipal offices under consideration; Town Council.

HARROW.—Five houses; Clarke & Co., estate agents, Harrow.

HASLINGDEN.—Houses, Cross Street North, for S. Barnes. Haywood and Harrison, architects, Post Office Chambers, Accrington.

HATFIELD.—Pair of villas for A. Gray.

HAWARDEN.—Council school at Shotton (500 scholars). S. Evans, county surveyor, County Offices, Mold.

HECKMONDWIKE.—New Elementary School for the West Riding Education Committee. J. Vickers-Edwards, county architect, County Hall, Wakefield.

HELMSLEY.—Wesleyan Chapel at Harome. W. J. Morley & Sons, architects, 269, Swan Arcade, Bradford.

HELSTON (Cornwall).—House and shops, Meneage Street, for J. Rowe; Gunwalloe, H. A. L. Rowe, ironmonger; and Godolphin Road, for F. Roberts. Alterations at Meneage Street United Methodist Church (£200).

HERTFORD.—House and shop, London Road, Knebworth, for E. J. Dearman.

HORSHAM.—Prospective rebuilding, after fire, of Cowfold Lodge, for A. Labouchere.

HINDSFORD (South Lancs.).—Extensions at St. Anne's Church. Rathbone and Sons, contractors, Atherton.

HITCHIN.—Villas, Old Park Road. Messrs. Upchurch, builders.

HORWICH (Lancashire).—Alterations at shop premises, Lee Lane, for Messrs. Boots, Ltd.; alterations at "Bowling Green" Inn, for C. Harrison.

ILFORD.—New Isolation Hospital. Armstrong & Wright, architects, 38, Grainger Street West, Newcastle-on-Tyne.

IPSWICH.—Isolation Hospital at Burham, for the Bosmere and Claydon R.D.C. Bisshopp & Cautley, architects, Ipswich.

KETTERING.—Church for St. Michael's Mission. Gingir, Lee & Co., contractors, Manchester.

KING'S NORTON.—Additions to the surveyor's office, Breedon Cross. J. S. Hall, surveyor, Breedon Cross, King's Norton.

KINGSWOOD.—Hall and classrooms in connection with Zion United Methodist Chapel.

KIRKBY-IN-ASHFIELD (Notts.).—Houses, Sampson Street, for Mr. Gore; Oxford Street, for J. Stow.

LEEDS.—New stores at the Kirkstall Road depôt for the Highways Department. Connon & Chorley, architects, 16, Park Place, Leeds.

LEIGH (South Lancs.).—New shed at Firs Mill, for Tunnicliffe & Hampson; billiard rooms at Baptist School, Smallbrook Lane; 14 houses, May Street and Firs Lane, J. Hayes; Primitive Methodist Church at Glazebrook (£1,700).

LETCHWORTH.—New school for the Hertfordshire C.C. U. A. Smith, County Surveyor, Hatfield.

LEYLAND (Lancs.).—Warehouse, Earnshaw Bridge, for John Pilkington, Ltd.; houses, Leyland Lane, Earnshaw Bridge, for Miss Bretherton; East Street, for the Co-operative Society. Renovation of the Parish Church; Rev. L. Baldwin, vicar.

LINCOLN.—Houses, Cecil Street, for C. Sands; Tealby Street, for C. Stiles; Fairfield Street, for A. E. Parkinson; shops, &c., Silver Street, for the Co-operative Society.

LINTHWAITE (Yorks.).—House and shop, Manchester Road, Milnsbridge, for Balmforth & Co.; houses, William Street, Milnsbridge, for J. Williams; house and two shops, Causeway Side, for Lawrence Walker.

LITTLE HULTON (near Bolton).—Proposed new shelters and bowls houses on Recreation Ground; Surveyor, Council Offices, Little Hulton. Conversion of shops into houses, for the Little Hulton Co-operative Society.

LONDON.—Rebuilding the Imperial Theatre, Westminster, on site 12 miles away.

(Collindale, N.W.).—Proposed extension of depôt. Chief Engineer, Metropolitan Electric Tramways, 4, South Place, E.C.

(Strand, W.C.).—Adapting Adelphi Restaurant for Government Offices, &c., for Queensland. Sir H. Tozer, Agent-General, 1, Victoria Street, S.W.

(Finchley, N.).—Premises in High Street, North Finchley, for London and South-Western Bank, 170, Fenchurch Street, E.C. Eight houses; C. W. Scott, builder, Church End Station, Finchley. Three houses; J. Chellingsworth, builder, Bibsworth Road, Finchley. First part of St. Alban's Roman Catholic Church; trustees.

(Hornsey, N.).—Fifteen houses; J. Farrer, architect, 2, Coleman Street, E.C. Moravian Sunday school; G. Mabey & Co., Upton Manor, N.

(Stroud Green, N.).—Two houses; A. W. Jones, North Finchley.

(Stratford, E.).—Additions to Young & Marten's (builders' merchants) premises. P. H. Adams, architect, 65, Leadenall Street, E.C.

(Finsbury Park, N.).—Alterations, &c., Beth Works, Dagmar Road; A. Pryke, builder, 74, Lancaster Road, N.

(Muswell Hill, N.).—Eighteen houses and one shop; W. J. Keith, architect, 7, East India Avenue, E.C. Gymnasium; T. D. Steed and Sons, builders, 2a, Langdon Place, N.

(Barking, E.).—Hospital buildings for District Council. C. J. Dawson, architect, East Street, Barking.

(West Ham, E.).—Additions to Custom House school (£1,350). H. C. Horswill, builder, 182, Green Street, Forest Gate, E.

(Stratford, E.).—Bacon stores, stables, &c., at Essex Works. W. Stewart, architect, 4, Aldgate, E.

(Canning Town, E.).—Wesleyan Sunday school. Withers & Meredith, architects, 50, Cannon Street, E.C.

(East Ham, E.).—Enlargement of business premises; J. D. Holtar, builder, 33, St. May's Road, Plaistow, E. Extension of Liberal Club; J. H. Carte, "Knighton," Aldersbrook Road, Ilford.

(W.).—Shops and show-rooms in Great Portland Street, W. J. W. Simpson & Maxwell Ayrton, architects, 3, Verulam Buildings, Gray's Inn, W.C.

(Wimbledon, S.W.).—Residence and motor-house; Boyton, Sons and Trevor, surveyors, 70, Coleman Street, E.C. Two houses; T. Eaton, builder, 126, Trinity Road, S.W. Conversion of St. George's College into Pension; R. A. Hinds, architect, Wood Nook, Wimbledon Hill. Twenty-nine houses, Melrose Avenue; C. Barwell, "The Elms," Morden, Wimbledon. Shop and show-rooms; Whitehead Bros., builders, 21, Hill Road, Wimbledon.

(Highgate).—Additions to Convent laundry. E. Kerry & Sons, builders, 63, High Street, Highgate.

(Forest Gate, E.).—Additions to St. James's Schools. Newman and Jacques, architects, 2, Fen Court, E.C.

LUTTERWORTH.—Alteration to premises in High Street, for J. Kingston-Smith.

LLANELLY.—New Y.M.C.A. premises (£5,000). W. Griffiths, architect, Falcon Chambers, Llanelly.

LLANTARNAM (Newport, Mon.).—House and workshop, for Truscott and Denning; 20 houses, shop and bakery, at Cwmbran, for R. Partridge.

MANSFIELD WOODHOUSE.—Houses, Park Road and Woodland Grove, for G. Stevenson; Grove Street and Booth Street, for H. T. Hardwick.

MARKET HARBOROUGH.—Rebuilding of tannery, The Commons, after fire; house, High Cross Street, for A. C. Brown.

MARSDEN (Yorks.).—Additions to premises for the Marsden Co-operative Society.

MELIDEN (Prestatyn, Flintshire).—Enlargement and improvement of the vicarage.

MELTHAM (near Huddersfield).—Alterations and additions to Spink Mire Mills for Quarmby & Sykes, Ltd.

MELTON MOWBRAY.—New premises in the Market Place for Young Men's Institute.

MIDDLETON ST. GEORGE (Co. Durham).—New baths.

MOTHERWELL.—Villa in Silvertonhill Avenue (£1,000). J. Wilson, architect, Park Cottage, Motherwell.

MOUNTAIN ASH.—Vestry for the Soar Congregational Trustees. T. W. Millar, architect, Mountain Ash.

NEWCASTLE-ON-TYNE.—Block of 10 homes at Walker Gate for aged miners. Extensive additions to the works of W. G. Armstrong, Whitworth & Co.

NEW MILLS (Derby).—Proposed public library for the U.D.C.

NEWPORT (Mon.).—Block of almshouses near Springfield.

NEWPORT (Isle of Wight).—Business premises, Nodehill (£1,096). J. Meader, jun., builder, Cowes.

NORWICH.—Probable alteration and extension of premises in St. Stephen Street for the Co-operative Society.

OBAN.—New Post Office. H.M. Office of Works, Parliament Square, Edinburgh.

OLDHAM.—Mission-room at Grains Bar in connection with East Crompton Church (£500). Proposed additions at the Osborne Cotton Mills.

PARKHURST (Isle of Wight).—Proposed prison for Parkhurst Forest.

PATRICROFT.—Additions to offices for Nasmyth, Wilson & Co., Ltd., engineers, Bridgewater Foundry; 18 houses, Gilbert Street, Peel Green, Patricroft; 13 houses, Fir Street, Patricroft, A. Lockwood.

PENDLETON.—Villas and other houses on Claremont Estate; D. Oldham, Rudyard Road, Irlams-o'-th'-Height, W. J. Lamb, Stretford, and Heys & Davies, builders, Seedley, Manchester.

PERTH.—Alterations on works for Messrs. Cameron, saw millers, Shore.

PINNER.—Four houses. F. and W. Bettesworth, builders, 9, Strode Road, Willesden Green, N.W.

PONTEFRACT.—New school (500 scholars). Town Council.

POOLE.—Salvation Army hall at Lytchett Matravers.

PRESTON.—Proposed extensions at the Royal Albert Asylum.

PUDSEY.—Secondary and technical schools. Jowett, Kendal & Sons, architects East Parade, Leeds.

RAMSBOTTOM (Lancs.).—Additions to Redisher Works, Holcombe Brook, for C. Ainsworth & Co., Ltd.

REIGATE.—Motor garage, Walton Heath, for the Walton Heath Golf Club, Ltd.; house, Duffield's Lane, for Dr. K. Goadley, A. S. R. Ley, architect; office, Victoria Road, Horley, Hallett & Ballard, builders, Horley; shop, Victoria Road, Hallett & Ballard, builders.

RICHMOND.—Business premises, North Road; W. Vincent, architect, 8, West Park Crescent, Kew Gardens. Two houses; Boore & Parker, builders, 15, Station Parade, Richmond. Eight houses; Brewer, Smith & Brewer, surveyors, 11, The Green, Richmond.

RICKMANSWORTH.—Villas, Money Hill, for Franklin & Fisk.

ROCHDALE.—Fourteen villas, Buersill Avenue, for Wm. Shepherd. H. H. Clough, architect, Butts Avenue, Rochdale.

ROTHERHAM.—Additions and alterations to boot and shoe shop and workshop, College Road and Winifred Street, for E. Simpson. Business premises and two dwelling-houses, Fitzwilliam Road and Cottenham Road, Rotherham; Masbro' Equitable Pioneers' Society, Ltd., Masbro'. Nine houses and one shop, Gladys Street, Middle Lane, Rotherham; T. Green, builder, Eastwood Mount, Rotherham. Four houses, York Road; H. Addis, York Road. Secondary School for Girls, in Middle Lane (£12,287); H. Arnold & Sons, contractors, Doncaster.

ROTHESAY.—Proposed pavilion on the Esplanade. Town Council.

ROYSTON (Yorks.).—Houses, for E. Larkins, T. Stendall, and M. Dixon and Son, Ackworth; new Salvation Army Barracks.

RUGBY.—Proposed extensions for the Co-operative Society.

RUNCORN.—Houses, Heath Road, for J. and A. Savage; Picton Avenue, for the Littler Concrete Co.; Weston Road, for J. Yearsley; Heath Road, for W. Farrell.

(Stockton Heath).—Council School. J. Holt, architect, 9, Albert Square, Manchester.

RUSHDEN.—New premises for the Co-operative Society.

ST. ALBANS.—Pair of villas, Brampton Road, for E. Dunham, builder, 65, Victoria Street. Mission room, Kinsbourne Green, for H. G. Papillon.

ST. ANNES-ON-THE-SEA (Lancs.).—Bungalow, St. Andrew's Road South, for S. Ashworth; detached villa, St. Anne's Rood East, for T. Willis; houses, St. David's Road North, for Thos. Muirhead; St. David's Road North, for I. Leadbetter; St. David's Road North, for W. Wilkinson. New Primitive Methodist Church in South Drive. Institute and Public Hall at Ansdell; G. H. Willoughby, architect, Manchester.

ST. GERMANS (Cornwall).—Wesleyan Methodist Church at Tideford (£1,200).

ST. HELENS.—Conveniences, Thatta Heath Park, for the T.C. Geo. J. C. Broom, borough engineer.

ST. IVES.—House at Somersham. F. Giddings, builder, St. Ives, Hunts.

ST. MARY CRAY.—Adaptation of "Lads of the Village" public house for Post Office. W. Winburn, builder, Croydon.

SALFORD.—New Baptist Church, Nursey Street (£2,300). Mr. Cook, architect, Manchester.

SHEFFIELD.—Primitive Methodist place of worship in Greystones Road.

SHERBORNE.—New Church Hall (£2,700).

SHOEBURYNESS.—New Roman Catholic Church in Ness Road. Proposed public offices for the U.D.C. (£900).

SHUTTLEWORTH (Lancs.).—Probable developments at Higher Mill. Shuttleworth Bleaching Co., Ltd.

SKELMANTHORPE.—Branch bank and dwelling houses in Station Road, for the Lancashire and Yorkshire Bank.

SOUTH MOLTON (Devon).—Additions to North Road Schools (£1,498). W. Sanders & Son, builders, South Molton.

SOUTH PETHERTON (Somerset).—Wesleyan Methodist Church Schools at Stoke (£1,000).

SOUTH SHIELDS.—Eleven houses in Banbury Street, for W. Clunie & Sons. J. H. Morton, architect, King Street, South Shields.

SPALDING.—House, with bank, for Mrs. C. Fillingham. R. H. H. Hand, architect, 6, Double Street, Spalding.

SPENNYMOOR.—Two houses, Ruby Terrace, Tudhoe Grange. Write to the Post Office, Tudhoe Colliery.

SPILSBY (Lincs.).—House, for J. Fletcher, Hagworthingham, Spilsby.

STAINES.—Proposed isolation hospital. F. Hutchinson, clerk to the R.D.C.

STANDISH (Lancs.).—Suggested public baths. District Council.

STOCKPORT.—Wesleyan Methodist Church at Aspinal Gorton, Nort Reddish.

SUNDERLAND.—New stables, &c., for Steel & Co.; W. & T. R. Milburn, architects, 20, Fawcett Street, Sunderland. New worshops, offices, stores and caretaker's house, for the T.C. (£2,450).

SUTTON-IN-ASHFIELD.—New nave at St. Michael's Episcopal Mission Church.

SWINTON (Manchester).—Probable extension of weaving shed. Mr. Hully, cotton goods manufacturer, Station Road, Swinton.

TAMWORTH.—Congregational School-Chapel at Dordon (£825).

TANTOBIE (Co. Durham).—Twenty-two houses for the Tantobie Co-operative Society, Ltd. G. T. Wilson, architect, 22, Durham Road, Blackhill.

TIPTON.—Proposed baths. Urban District Council.

TORPOINT (Cornwall).—Addition to the Wesleyan Church. Thorneley and Rooke, architects, 11, The Crescent, Plymouth.

TURTON (Lancs.).—New institute, at Edgworth, for J. R. Barlow, J.P.

WALKDEN.—New shop premises in Walkden Road. J. T. Proffitt, architect, Longley Road, Walkden.

WALSALL.—Primitive Methodist school at Walsall Wood.

WARE.—Engine house, at Broxbournebury, for G. R. Smith-Bosanquet; additions to High Oak House, for Mrs. R. B. Croft.

WATFORD.—Houses, Station Road, for H. Franklin, Aldenham; Aldenham Grove, Radlett, for W. G. Taylor; Crosspath for W. G. Taylor, Aldenham.

WEALDSTONE.—Three houses. E. S. Bates, builder, 57, Barrington Road, Hornsey, N.

WHITCHURCH.—Primitive Methodist Church and school at Tilston.

WHITSTABLE.—Re-erection of the New Pavilion. J. Rowland, manager.

WIGAN.—Refuse destructor at Bradford Place. Borough Engineer, Wigan.

WINCHESTER.—Additional County Council offices.

WINSFORD (Cheshire).—Golden Lion Hotel to be rebuilt for Greenall, Whitley and Co., Ltd., Wilderspool Brewery, Warrington.

WORSLEY.—Additions to property for T. W. Lowe and Mr. Lucas, Moorside, Worsley; G. Partington, Moss Lane, Walkden; and Messrs. Sharman & Sons, brewers, Bolton. Housing scheme under consideration. District Council.

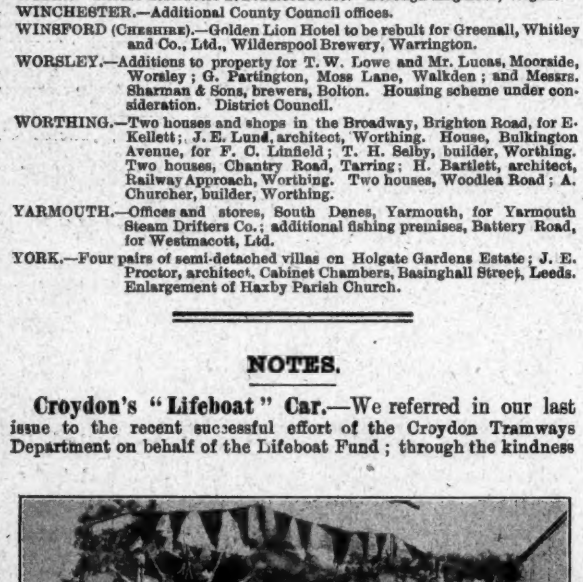
WORTHING.—Two houses and shops in the Broadway, Brighton Road, for E. Kellett; J. E. Lund, architect, Worthing. House, Bulkington Avenue, for F. C. Linfield; T. H. Selby, builder, Worthing. Two houses, Chantry Road, Tarring; H. Bartlett, architect, Railway Approach, Worthing. Two houses, Woodlea Road; A. Churcher, builder, Worthing.

YARMOUTH.—Offices and stores, South Denes, Yarmouth, for Yarmouth Steam Drifters Co.; additional fishing premises, Battery Road, for Westmacott, Ltd.

YORK.—Four pairs of semi-detached villas on Holgate Gardens Estate; J. E. Proctor, architect, Cabinet Chambers, Basinghall Street, Leeds. Enlargement of Haxby Parish Church.

NOTES.

Croydon's "Lifeboat" Car.—We referred in our last issue to the recent successful effort of the Croydon Tramways Department on behalf of the Lifeboat Fund; through the kindness



The Croydon "Lifeboat" Car.

of Mr. T. B. Goodyer, the tramways manager, we are enabled to illustrate the decorated car which was instrumental in achieving such excellent results.

Smoke Nuisance.—In his annual report, which has just been issued, the Medical Officer of Health at Westminster (Dr. F. J. Allan) says that when some years ago the City Council suggested to other metropolitan boroughs the desirability of taking steps to have the qualification "black" omitted from the section of the Public Health Act which deals with smoke nuisances, they did not, apparently, appreciate that as much nuisance might be caused by brown or yellow smoke as by black. But the failure of a neighbouring borough (Chelsea) to obtain a conviction against a company producing electric power, on the ground that the smoke was not black, accompanied by the payment of 300 guineas costs to the company, has once more directed attention to the matter. It appears to have been contended, says the Medical Officer, that the whole construction of, and method of using, the generating station were as perfect as human ingenuity could devise. It was also represented to the magistrate that the conversion of the underground railways to electric traction had conferred inestimable benefits on the inhabitants of London. As Westminster suffers to some extent from the smoke given off from the chimneys of the generating station at Lot's Road, it is, he says, of interest to observe in the report of the Public Health Board of New York for 1905 that generating stations there are even more perfect in this respect than is the Chelsea one, in that they do not give off smoke at all. The report says:—"In the borough of Manhattan at the present time there are six large power houses consuming an enormous quantity of coal every 24 hours and producing a great amount of electrical power. This power is utilised in lighting hotels, theatres, public buildings, the public streets, and in operating the three great systems of transportation, the subway, the surface railways and the elevated roads. All of these plants have been conducted, through the co-operation of the managing officials, with very little, if any, discharge of smoke, with one exception, and in that case the operating officials have made very strong efforts within the past two or three months to entirely discontinue the discharge of smoke and abate any nuisance which may exist." If this can be done in New York, adds the Medical Officer, local authorities should insist on having similar powers here. Westminster had 1,234 hours of sunshine in 1907 (90 more than the average), but in the suburbs there were over 200 hours more sunshine than in Westminster; further out the additional hours of sunshine rose to 400, and at south coast towns there were 500 to 600 extra hours. With stricter powers for suppressing smoke, these differences, with their consequent expenses, might be considerably reduced.

A Gilbertian situation was witnessed at the Blackpool Police Court on Monday morning, when the town clerk, Mr. T. Loftus, was summoned at the instance of the Health Department of the Corporation for allowing black smoke to issue from the chimney of the Corporation electricity works. The deputy town clerk, Mr. J. W. Loftus, son of the town clerk, prosecuted, and the defendant was ordered to pay the costs.

Alice in Electroland.—Alice followed the White Rabbit until they came to what looked like a cucumber frame.

"Oh," said Alice, "I didn't think you grew cucumbers in an Electricity Works."

"They are not cucumbers," said the Rabbit.

"Tomatoes?"

"No."

"Vegetable Marrows?"

"No, stupid! Look at 'em. We have to put 'em under glass to keep 'em alive."

Alice looked, and made out that sticking up from the ground were a lot of things like screws, only smaller.

"Why," said Alice, "they look like—"

"Exactly," said the White Rabbit, "They *are* screws. The Electricity Works' Staff's screws, you know."

"But I didn't think screws *grew*," said Alice.

"They don't," replied the Rabbit, sadly.—Pablo, in "Glover's Almanac."

Copper.—In view of the reports on this metal for July 31st, the sharp rise in the metal now taking place is abnormal. Messrs. Merton's statistical report for that date showed visible supplies at the extraordinary figure of 42,134 tons; stocks of standard copper in England rose from 22,696 tons on July 15th to 25,455 tons on the 31st; and afloat from Chile and Australia 9,850 tons, an advance of 550 tons on the quantity afloat at the end of June. Deliveries had certainly fallen slightly (33,528 against 34,996), and supplies from North America are rather down, from which the market probably gets its tone. Spain, however, registers 5 679 tons, Chile is well up to average with 3,200, and the same may be said for Australia, with 3,700. The advance in price can only be due to persistent "limited production" rumours.

Shock Fatalities.—An inquest was held on the 11th inst. on a small boy named Edwin Bricknell, who was found lying against the conductor rail on the Metropolitan Railway at Notting Hill. The evidence showed that the boy climbed a low garden wall, and in passing over the metals he received a fatal shock. The jury returned a verdict of "Accidental Death."

On Wednesday, Mr. Brighouse, County Coroner, held an inquest at Ince, Wigan, touching the death of John M'Cormick, 18, of Great George Street, Wigan, an attendant at the works of the Wigan Coal and Iron Co., who fell across three "live" wires attached to an electric coal stamper. Dr. Fletcher said that he found nothing to account for death except shock. A voltage of 600 was quite sufficient to prove fatal.

A fireman at the works said instructions were given verbally that deceased had not to oil the machinery while the current was on. The Coroner said that if he were the manager, he would have a book of instructions, so that if they were disobeyed he could point to them. He asked whether it would not be better to adopt some method by which the live wires could be protected, so that if a man inadvertently went to the stamp with the current on, he might still be protected? A fireman at the works said they had done all they possibly could.

The Coroner said that Mr. Clarke, H.M. Inspector, had made a practical suggestion—that there should be a shield fastened to the apparatus, so that the "live" wires would be behind it.

The jury found that the deceased came by his death by a shock from the electric wires, and suggested that the machine should be shielded as stated, and that each person should receive printed rules.

It was agreed that H.M. Inspector and the works manager should confer with this object in view.

Acetylene Gas Explosion.—An explosion of acetylene gas was the cause of the fire which last week completely destroyed Cowfold Lodge, near Horsham, the residence of Mr. Arthur Labouchere.

Elongation of Bronze Wires.—To prevent bronze wire, newly erected, from stretching and coming into contact with other wires, the German telegraph department states that the best plan is to subject the wire twice in succession, for a period of two or three minutes, to a tension slightly less than that which it will have to sustain when in use. This should be done immediately before the wire is erected.

Will.—According to the *Times*, the Hon. Henry Marsham, of the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd., whose death we recently announced, left estate valued at £30,142 net.

Institution and Lecture Notes.—British Foundrymen's Association.—The fifth annual meeting was held at Newcastle-on-Tyne on August 4th, 5th and 6th. Mr. J. E. Stead, Bessemer Medalist of Middlesbrough, gave a lantern lecture upon "Sulphur and Phosphorus in Iron." Mr. R. W. Kenyon, Accrington, read a paper on "Securing the Co-operation of the Workman in the Improvement of Workshop Methods." On Wednesday Mr. P. Munnoch read a paper on "The Practical Application of Chemistry to the Foundry"; Mr. J. Smith, South Shields, one upon "Methods of Work in a Foundry," and Mr. G. M. Riches, Beccles, on "Theory and Practice in a Foundry."

Institution of Electrical Engineers (Cape Town).—At a meeting of this local section, held at the South African College on July 6th, Prof. Bohle was elected chairman, and Mr. C. Procter Banham hon. secretary for the ensuing year.

Educational Notes.—The University of Leeds.—The new building, equipped completely for electrical engineering instruction, will be open for work at the beginning of the Session, October 5th. Prospectuses of the courses may be obtained from the Registrar.

Glasgow and West of Scotland Technical College.—The Session of this College opens in the new buildings on Monday, September 21st. The preliminary examination begins on September 14th. Particulars will be found in our advertisement pages.

Fixation of Nitrogen in Norway.—The State Council of Norway has under consideration an application for a concession for 75 years for permission to carry out works for the "regulation" of the Tyins River up to the commune of Ardal, so as to allow of the utilisation of from 60,000 to 70,000 h.p. The scheme forms part of that which is already in course of development under the auspices of the German aniline dye works known as the Baden, Elberfeld and Aniline Manufacturing Companies, for the purpose of producing nitrates from atmospheric nitrogen. In order to carry out the project, this German combination became associated with a Franco-Norwegian syndicate which also owns patents in the direction of the fixation of atmospheric nitrogen, and which has considerable water-power at its disposal in Norway. It is now proposed to form two Norwegian companies, one of which is to undertake the extension and utilisation of the existing water-powers, whilst the other will erect and work factories for the production of nitrates. The former company represents the object of the application now pending for a concession. The cost of the regulation of the Tyins River is estimated at 10,000,000 crowns, and that of the whole of the works is computed at 40,000,000 crowns. It was originally calculated that the total expenditure in the next few years would be 34,000,000 crowns, of which one-half devolved upon the German combination, and one-half upon the Franco-Norwegian syndicate. The German companies have already made fresh issues of capital totalling £1,750,000, so as to be ready for the work, and this is stated to have been successfully placed at the rate of 105 per cent.

Transformers and Metallic-Filament Lamps.—A correspondent raises a very important question regarding the use of transformers and low-voltage tungsten lamps on alternating-current circuits. He has recommended a great many of his clients to adopt these, on account of the great economies that can be effected by transforming down to 25 volts. He finds, however, that the supply authorities refuse to connect up any transformer unless it has a loss of 15 watts on open circuit. As some of the transformers which he intends fixing have a total capacity of 200 watts only, this represents a loss in the transformer of 7½ per cent., which is, of course, going on all the time, and would reduce very materially the saving effected by the adoption of tungsten lamps. Our correspondent considers that a policy which deliberately insists upon the manufacture of inefficient apparatus is wrong, and that supply authorities, if they fear the introduction of tungsten lamps is likely to impair their revenue, should revise their charges instead of insisting on a continual waste in the transformer. He is anxious to learn what the legal aspect of the case is.

The point is certainly one of great interest. On the face of it, we should say that the supply authorities are exceeding their legal powers. The only grounds upon which they can refuse to connect an installation are that the wiring, &c., is not in good order, and that to give a supply to the installation would injuriously affect the use of energy by other persons. These arguments obviously have no bearing at all upon the question raised by our correspondent; moreover, the undertakers are forbidden to prescribe the use of any special form of lamp or to interfere in any way with the manner in which electricity supplied by them is used. It appears, therefore, that the action—or rather inaction—of the supply authorities is wholly unjustifiable.

We do not say that it is unreasonable—from the suppliers' point of view; for they stand to suffer a very serious loss through magnetising numbers of transformers all day, without a record being effected upon their meters. That, however, is the fault of the meters; the suppliers cannot compel users to conform to the defects of the latter, and never to consume less than the starting current! A.C. meters are on the market which will record 5 watts out of 200, and therefore the suppliers cannot plead inability on this score. We suggest, however, as the proper solution of an awkward situation, that automatic switches be adopted to cut out the transformers when no lamps are burning. These are readily obtainable, and their cost is small.

Appointment Vacant. — Foreman for telephone line construction for the Ceylon Government, on three years' engagement. See our advertisement pages for particulars.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. J. Slevin, the electrical and tramways manager of the Wigan Corporation, has, we understand, intimated to the chairman of the E.L. Committee that, in view of his having been relieved of a certain portion of his duties in the tramways department in consequence of the appointment of a traffic manager, he was agreeable to a reduction of £50 from his present salary.

At the Torquay electricity works last week Mr. Arthur G. Pratt was presented with a gold-mounted fountain pen on his leaving to take up the appointment of engineer and manager to the Wadebridge and District Electric Supply Co.

The Wolverhampton T.C. has been recommended to increase the salary of Mr. H. A. Howie, assistant electrical engineer, from £180 to £200 per annum.

The Eccles T.C. has increased the salary of Mr. Angus, electrical engineer, from £250 to £350 per annum, by £50 the first year and £25 in the succeeding two years.

Mr. T. W. Hudson, of Idle, has been appointed works engineer at the Lancaster Borough Electricity Works. There were 47 applicants for the post.

Tramway Officials.—On Tuesday last week, at the Recreation Room, the staff and employés of the Sunderland District Electric Tramways, Ltd., presented Inspector Varley with a marble clock and two bronzes on the occasion of his marriage.

The Reading T.C., on August 6th, decided to increase the salary of Mr. Walter Binns, tramways manager, from £500 to £600 per annum, by two yearly increments of £50 each. A negative resolution was lost by 22 votes to 7.

General.—Mr. Charles F. Trippe, who was connected with the General Electric Co., Ltd., Queen Victoria Street, for 12 years, and is now established in business on his own account, at 36, Brooke Street, Holborn, was married on 8th inst.

Indian Engineering states that Mr. A. E. K. Pitcher, an officer of the Government Telegraph Department, has been offered and has accepted the appointment of Telegraph Superintendent on the South Indian Railway.

Mr. A. J. Andrews asks us to announce that he has severed his connection with the Accessories Manufacturing Co., Ltd., and that all correspondence intended for him in future should be addressed to him at 75, Mark Lane, E.C.

Obituary.—We regret to record the death of Mr H. S. R. Parton, the secretary of the Sheffield Corporation electric light department, under exceedingly sad circumstances. The deceased gentleman, who was born of English parents in Philadelphia in 1853, was spending a holiday with his family at Sutton-on-Sea, and on Saturday last, while bathing with his eldest son, aged 14, he succumbed. It appears that they got into a deep clay hole into which the tide was pouring, and Mr. Parton strained himself somewhat violently in holding his son up against the swirl of the water. The son was saved. A verdict of "Death from Apoplexy" was returned. Mr. Parton was in the employ of the Sheffield Electric Lighting Co. as long ago as 1892, as assistant manager to Mr. Johnson. He had been continuously in the service of the undertaking from that time forward.

We regret to announce the death, at the age of 68 years, of Mr. James Sheppard, who for some 10 years past has been a member of the Executive of the British Fire Prevention Committee, and a most active worker in all fire preventive questions. He was most actively associated with the testing operations of the Committee, having been the directing member on no fewer than 40 tests in respect of which reports have been issued. For the International Fire Congress held in London in 1903 he was the honorary secretary of the meeting.

The death took place tragically on August 5th, of Alderman Metcalfe, who was chairman of the Burnley Tramways Committee, to which position he was appointed in 1906, in succession to the late Alderman Armistead. He had been vice-chairman for some years, and he spent much time in the interests of the tramway and electricity undertaking.

NEW COMPANIES REGISTERED.

"Electricity," Ltd. (99,119).—This company was registered on August 6th, with a capital of £1,000 in £1 shares, to acquire from C. A. F. Duranty the benefit of certain inventions relating to the production of electricity, and to carry on the business of electricians, engineers, suppliers of electricity for light, heat, power or other purposes, &c. The subscribers (with one share each) are:—C. E. de Wolf, 27, BidstoneRoad, Oxton, shipowner; W. C. Bacon, 14, Cross Street, Manchester, shipowner; T. F. Harrison, 67, South John Street, Liverpool, shipowner; H. E. Fry, Godmanstone, Dorchester, gentleman; F. S. Watts, 7, Whittingham Avenue, E.C., shipowner; N. Denny, The Moat, Eltham, Kent, merchant; J. Rankin, 67, South John Street, Liverpool, shipowner. Private company. The number of directors is not to be less than three or more than five; the first are C. A. F. Duranty and C. E. de Wolf, and the following nominees of C. E. de Wolf, viz.: W. C. Bacon, N. Dunn and T. F. Harrison (all permanent). Table "A" mainly applies. Registered by Walker, Son & Field, 61, Carey Street, W.C.

Benjamin Electric, Ltd. (99,126).—This company was registered on August 5th, with a capital of £1,000 in £1 shares, to acquire from the Benjamin Electric Manufacturing Co., of Chicago, Illinois, U.S.A., the benefit of certain existing inventions relating to electrical clusters and lighting specialities, and to carry on the business of electricians, producers and workers of and dealers in electricity for power and lighting purposes, &c. The subscribers (with one share each) are:—R. B. Benjamin, Hotel Cecil, W.C., engineer; B. J. Grigsby, 46, Pembridge Villas, Bayswater, W., engineer; A. Bathurst, 70, Redcliffe Square, S.W., solicitor; J. Lord, 81, Old Jewry, E.C., solicitor. Private company: The number of directors is not to be less than two or more than six; the first are R. B. Benjamin, W. D. Steele, W. C. Jones, K. H. Addington and B. J. Grigsby; no qualification necessary; no remuneration. Registered by Freshfields, 31, Old Jewry, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

British Westinghouse Electric and Manufacturing Co., Ltd. (62,919).—This company's annual return was filed on June 15th, when the entire capital of £1,875,000 in 500,000 preference shares of £3 each and 75,000 ordinary shares of £5 each had been taken up. £3 per share has been called up on the preference, resulting in the receipt of £1,500,000. £375,000 is considered as paid on the ordinary. Mortgages and charges: £1,491,353.

Tonyrefail and Gilfach Goch Electric Light Co., Ltd. (78,637).—This company's annual return was filed on July 20th, when 3,421 shares had been taken up out of a nominal capital of £5,000 in £1 shares. £1 per share has been called up, resulting in the receipt of £3,406 15s. £14 5s. remains in arrears. Mortgages and charges: £935.

Durham Collieries Electric Power Co., Ltd. (83,421).—This company's annual return was filed on July 17th, when 85,619 preference and 25,045 ordinary shares had been taken up out of a nominal capital of £155,000 in 125,000 6 per cent. cumulative participating preference and 30,000 ordinary shares of £1 each. £1 per share has been called up on 85,102 preference, and 10s. per share on 517 preference and 45 ordinary, resulting in the receipt of £85,380. £3 remains in arrears. £25,000 is considered as paid on £25,000 ordinary. Mortgages and charges: £150,000.

Anglo-Argentine Tramways Co., Ltd. (25,363).—A statement of the total amount outstanding on July 1st, in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Indenture dated August 13th, 1888, securing £266,000 debenture stock, charged on the company's concessions, tramways, stations and property.

Durham Collieries Electric Power Co., Ltd. (83,421).—A mortgage dated July 15th, 1908, to secure £2,500, charged on the company's undertaking and property, present and future, has been registered. Holders: Trustees and Executors Insurance Corporation, Ltd., Old Broad Street, E.C.

African Direct Telegraph Co., Ltd. (21,895).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Debentures dated February 23rd and March 22nd, 1893, on which £28,200 is outstanding.

Central Electric Supply Co., Ltd. (London) (53,080).—A charge under the Land Transfer Acts, 1875 to 1897, dated June 15th, 1908, to secure £50,000 further stock and a premium of £5,000 thereon (supplemental to a trust deed dated July 2nd, 1901, securing £250,000), has been registered. Property charged: Certain land in Marylebone. Trustees: Rt. Hon. A. Lyttleton, K.C., 3, Paper Buildings, Temple, E.C.; and Wm. Hayes Fisher, 13, Buckingham Palace Gardens, S.W.

Mountain & Gibson, Ltd. (85,036).—Particulars of £30,000 debentures created by resolution of July 17th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907. Property charged:—The company's undertaking and property, present and future, including uncalled capital. No trustees. Amount of present issue, £20,000.

Reason Manufacturing Co., Ltd. (64,701).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—Trust deed dated December 18th, 1900, securing £25,000, charged on certain land in Preston, Brighton, with factory and other buildings thereon, and company's general assets.

Northampton Electric Light and Power Co., Ltd. (28,640).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—First mortgage debentures dated 1896 to 1900, securing £19,800, and second debenture dated November 15th, 1899, securing £3,600.

Eastern and South African Telegraph Co., Ltd. (13,306).—This company's annual return, made up to May 28th, has been filed. The entire capital of £600,000 in £10 shares has been taken up and paid for in full. Mortgages and charges, £449,500.

Guildford Electricity Supply Co., Ltd. (36,725).—Particulars of £25,000 debentures created by resolution of November 21st, 1905, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £200. Property charged:—The company's undertaking and property, present and future, including uncalled capital. No trustees.

Norfolk Electrical Co., Ltd. (98,700).—Particulars of £1,000 debentures created by resolution of June 13th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being now issued. Property charged:—The company's undertaking and property, present and future, including uncalled capital. No trustees.

REVIEWS.

Thermochemistry. By J. Thomsen. Translated from the Danish by K. A. Burke, B.Sc. London: Longmans, Green & Co. 1908. Price 9s.

The subject of thermochemistry is a somewhat curious one. It may be likened unto the foundations of a large building laid many years ago, upon which the upper part designed by the original architect has never yet been erected. The man who dug out the ground actually put in most of the concrete himself, and the footings were so well and truly laid that they have endured to the present time. The same man, too, sketched the broad outlines of the superstructure he hoped to erect, and even got ready a large number of the special bricks required for the work above-ground; but partly for the want of a suitable scaffold, and partly because the younger generation of bricklayers have had their attention diverted into other directions, the job has never been completed. Still, the foundations are there, and, undoubtedly, they will carry a handsome edifice one of these days which shall serve as a worthy memorial of the life-work of Julius Thomsen.

It is doubtful whether any other branch of science has been so largely monopolised as that of thermochemistry. Regnault, Andrews, Berthelot, Favre and Silbermann, and others have made here a measurement and there a calculation; but nearly all the data we possess were obtained in the laboratory of Copenhagen University by the author of this book. Thomsen's researches occupied over 20 years, and the results were collected in an enormous monograph of four volumes entitled "Thermochemische Untersuchungen," the last of which was published in 1886. This volume, of course, is indispensable to the student of thermochemical phenomena, as it contains full details of the experimental methods employed by Thomsen; descriptions of the logical processes whereby he did succeed in inducing some hypotheses and theories from the facts observed, as well as a complete list of the numerical values he obtained. The very size of the book rendered it difficult to consult, and fit to be kept only on the shelves of a large library. Certainly, most of the more frequently required data were reproduced for British readers in one of the supplemental volumes of Watt's Dictionary of Chemistry; but this, again, is a book almost outside the ken of the younger physical chemist. Hence, Prof. Thomsen was led a few years ago to prepare a smaller book entitled "Thermokemiske Resultater" in the Danish language, from which practically all experimental details were omitted, and in which only the numerical and the theoretical results of the earlier treatise were incorporated. According to his own preface, Prof. Thomsen found an additional reason for the publication of the smaller book in the fact that his determinations were being freely quoted without acknowledgment of their origin; but he is mistaken if he thinks such omission a matter gravely affecting his personal rights. Even to this day a thermochemical constant quoted without the investigator's name almost inevitably means a Thomsen constant.

The "Thermokemiske Resultater" was, therefore, a book to be gladly welcomed, although its appearance in one of the lesser known languages of Europe seriously diminished its practical utility. We can stand books in German, French, and even American. Indeed, we see little need for their translation into our own tongue; but we must draw the line somewhere, and propose to do so at the trilogy. Hence, in offering us in this country a translation of Thomsen's last Danish book, Miss Burke has done us a real service, which, apart from the importance of the book itself, is not to be compared with that performed by a translator from the French or German.

As already stated, the volume before us is essentially a translation of Thomsen's "Thermokemiske Resultater," which was issued in 1905. It, however, contains an introductory chapter of some thirty pages, abstracted from the last volume of the "Thermochemische Untersuchungen" by the translator, in order to give the reader of the English

version a sound working idea of the experimental methods adopted by Thomsen. The rest of the book is divided into four main parts which deal with the heats of formation or decomposition and other related properties of aqueous solutions, compounds of non-metals, compounds of metals with non-metals, and organic substances, respectively. Each part is subdivided into several chapters containing separately tables of the actual constants observed and calculated by Thomsen, comparison of, and reflections upon, the magnitudes and relationships of the figures, and discussions of the nature of chemical reactions regarded from a dynamical standpoint.

If the one feature characterising thermochemistry that we have already indicated is kept carefully in sight, the Danish volume "Thermokemiske Resultater" must be considered wholly satisfactory. Most science text-books are compilations with a very occasional "new fact"—many of them are sheer digests of their predecessors. Their value, therefore, depends solely upon the assimilative and the reproductive power of the individual compiler, the latter of which, if we may use the phrase, is largely a matter of "literary" skill. If he has covered the old skeleton with more attractive flesh, if he has clothed the flesh more in accordance with modern fashion in thought than other writers have done, his book is something beyond an unnecessary addition to current technical literature; but if he has failed in either respect . . . . Prof. Thomsen's book, on the contrary, is not a compilation in the usual sense of the word; it is a record of his own work, and, therefore, is purely original. In fact, it is so original that other investigators' results are largely excluded, on the ground that they are not comparable. Hence, the volume is not so much a text-book on thermochemistry by Thomsen, as a text-book on Thomsen's thermochemistry—a kind of scientific autobiography, so to say. We shall not find in it every constant determined by every physical chemist, not even every useful and trustworthy constant; and unless the student is prepared to remember this, he may to some extent be disappointed. We have for long wanted a convenient and comprehensive collection of all thermochemical data hitherto obtained, and that is not given us in the pages of the present volume. Nevertheless it is a great saving of time and labour to have all Thomsen's work put before us in a single book, and in our own tongue.

The actual book we have been examining is a further instalment of the set of text-books of Physical Chemistry now being brought out under the editorship of Sir William Ramsay. It extends to nearly 500 pages of nice clear type, printed on thick paper without the shiny surface that makes much modern print so difficult to read, and so bad for the eyes. Miss Burke is described on the title-page as assistant in the Department of Chemistry at University College, London. In the main she has done her task well, but here and there may be found sentences awkward in construction, and not as clear in meaning as might be wished. On page 53 we read that a certain effect will be produced "provided that no secondary reaction take place, which will almost always be the case"—an assertion that may convey either of two antagonistic ideas. We also find the old and incorrect word "gasometer" repeatedly employed, to mean "gas-holder"; and on page 38 we must convict Miss Burke (doubtless as scapegoat for the printers) of a numerical error that may create hesitation in the reader's mind, as to the absolute trustworthiness of the items in the copious tables that make up the real value of her book.

CITY NOTES.

Metropolitan District Railway Co.

The ordinary half-yearly meeting of this company was held on Wednesday at the Westminster Palace Hotel, Sir George S. Gibb presiding.

In moving the adoption of the report (see Electrical Review, p. 228), the Chairman said that they were the most satisfactory accounts that had ever been submitted since he had been chairman of the company, as they were in a much sounder financial position. They would remember that at the last meeting the directors submitted proposals for the creation of prior lien debenture stock in order to place the company on a sound and secure basis. Those proposals had been approved by the debenture-holders—they had got the consent of 89 per cent. of the 6 per cent. debenture-holders, and 80 per cent. of the 4 per cent. holders. He was sure they appreciated the confidence which the debenture-holders had in the directors. The Bill authorising the issue of the prior lien debentures had passed Parliament, and they were empowered to raise £750,000. They would have no difficulty in placing the stock—it would be a well-secured 4 per cent., and having first charge on actual rentals raised from surplus lands. The capital expenditure during the year had been £59,499. The estimated expenditure for the half-year was £75,000, which included ordinary expenditure, development of surplus lands, a number of improvements, expenditure on rolling stock, &c. It also included the substitution of another system in place of the air-worked doors, and the change would enable them to effect considerable economies. The temporary loans stood at £478,175, and they were redeemable at the most convenient time during the half-year. As they were not in immediate want of money, they did not propose to issue the new prior lien stock until after the holiday season. They would probably issue £550,000 in the autumn, and the interest on that would really take the place of the interest on the temporary loans. With reference to the revenue account, they could regard that with satisfaction. They had had a good half-year. They had carried 29½ million passengers, a slightly larger number than in any previous half-year—it was an increase of four million over the corresponding period of 1907, equivalent to 16½ per cent. In money the increase was £27,483, or 13½ per cent. Their traffic earnings were made up as follows: 8½ per cent. first-class, 10½ per cent. from workmen's, and 81 per cent. from third-class. Their season ticket revenue had increased by £8,326, which was a satisfactory increase. The average receipts per passenger was 1·88d., which was a very low average for a route 24 miles in length. When, however, they compared that figure with the one in September, 1906, when they revised the fares—1·68d.—it meant an increase in the revenue of £22,000. He thought they were witnessing a very large development in the passenger traffic of London. It was estimated that 667 million persons travelled in a year, and that was excluding persons using trunk railways having a termini in London. No doubt the special events which had occurred in London this year — the Exhibition, Suffragists' demonstrations, &c.—had affected the traffic to a degree, but, in his opinion, they had not added more traffic than the company was likely to get in future seasons. Persons would travel if they had a good system to use, and if only those who catered for travellers would have reasonable commercial wisdom, there was no doubt that the railways ought to yield largely increased earnings. Turning to the expenditure, that showed an increase of £10,893. The improved system of signalling had proved successful and the efficiency of the maintenance staff had contributed to the decrease in the expenditure on that account. The work done for other companies showed a credit of £5,000. That was mainly owing to the electrification of the London and Tilbury lines extension, which the District Railway worked. He was afraid that shareholders might take the return of the train and car-miles, which was in the ordinary statutory terms and apply them to the figures of the electric train working abstract, but that method gave them an entirely erroneous conclusion. The statement of the train and car-miles showed the car-mileage run on the District Railway, including that of the Inner Circle, North Western—between Earl's Court and Mansion House—the London and Tilbury, the City Joint Undertaking, &c. Altogether, of the 8,000,000 car-miles run by the District cars 42 per cent. were run off the District Railway, and of the six million train-miles of the District, 21 per cent. represented other companies. As regarded the increase in train-mileage, that had been 23 per cent. on the District Railway, and 16¾ per cent. of mileage run by the District cars for other companies. The car-mile receipts had been 9·27d. as compared with 9·24d. for the corresponding period of 1907. The net result of the half-year after paying debenture and other interests showed a balance of £8,951, that was to say, a debit balance. That figure compared with £18,035 balance in the first half-year of 1907, so they had improved their position by £9,084. To that had to be added the sum of £10,937 which was the company's proportion of the net revenue arising from City Lines Joint Undertaking. The total deficiency was £19,889 as compared with £28,191 for the corresponding period of 1907. That had been charged to capital account. The deficiency had been steadily declining, and he had no doubt that before long it would entirely disappear from these accounts.

Lord George Hamilton seconded the motion, and the report was adopted.

Liverpool Overhead Railway Co.

The half-yearly general meeting was held on August 11th at Liverpool, Sir Wm. B. Forwood presiding.

The Chairman, in submitting the report and accounts for adoption (see Electrical Review, p. 228), said that last February the directors were able to congratulate the shareholders upon a slight improvement in the company's earnings, which enabled them to pay a small dividend upon the ordinary shares. It was thought there had been a turn in the tide of their affairs, and that with the growth of the trade of the port the future was somewhat brighter. That expectation had not been fulfilled, as they had not realised that the American financial crisis would have such a far-reaching effect, and would paralyse trade in all parts of the globe. In common with all railway undertakings, the Overhead Railway had felt the stress of the great depression in trade, and it had not so far reaped any advantage from the cheapening of coal and all materials which the depression must inevitably bring about. The

line was essentially a traders' railway. When the trade of the port was slack the railway immediately felt it, and, considering how full the docks were of steamers laid up for want of employment, it was surprising that the shrinkage in their traffic had not been greater. As compared with the same half in last year, the first-class travel showed a falling-off of 17,769, and the third-class a decrease of 116,953; but in the cheap workmen's return tickets there was an increase of 92,000. Their net railway passenger traffic for the half-year showed a decrease of 42,148 passengers, representing £477. The gross revenue amounted to £37,868, and the working expenses were £30,511, leaving a gross profit of £7,357, from which must be deducted the interest on their debenture, £4,329, which left a balance of profit amounting to £3,027. Adding to this the balance brought forward of £4,178, there was available for dividend £7,206. Out of this a dividend of 5 per cent. was recommended on the 1892 preference shares. This would absorb £3,000, and leave a balance to carry forward of £4,206 16s. 9d. The company had effected a saving in its rates. The appeal to Quarter Sessions, though not entirely, was largely successful, and the saving in rates would be £1,600 or £1,700. In the working expenses there was an increase of £657, due to the increased cost of coal, oil and tallow, and also to the increased mileage run of 25,407 miles. The working of the tramways had been satisfactory, and they had materially contributed to the gross profits. The number of passengers carried by the tramways showed an increase of 14,161. The through bookings with the Lancashire and Yorkshire Railway were still disappointing. The renewal fund had now reached the sum of £35,913. On all the short lines of electric railways in London inquiry had been made into the cost of working their traffic, with the result that they had found that in adopting the fashionable penny fare for short distances they were following a "Will o' the wisp" which was leading them into a difficult financial position, if not to actual insolvency. At the half-yearly meetings of that company the shareholders were also carried away by the same feeling that the magic penny would restore prosperity to the line, and in consequence reductions were made in the fares, which so far had not been remunerative. The time had arrived when some slight revision of fares and the conditions of travel upon the line ought to be considered. The Overhead Railway had been built to supersede the old dock line of omnibuses, and during the first six years of its existence the results abundantly justified the views of its promoters. It had proved to be an enormous advantage to the trade of the port. The old dock omnibuses carried 2,000,000 passengers; last year the Overhead Railway carried 8,915,000. It was difficult to realise how the trade of the port could be conducted without the railway, and he had often thought they had a claim upon the Dock Board for a subsidy. If they could have foreseen the introduction of the telephone and the establishment of electric tramways, the Overhead Railway would certainly not have been built without substantial assistance from the Dock Board. They had also, unfortunately, suffered from the development of the dock estate, of which they did not, and could not, complain. The removal of the timber trade from the Canada Dock to Great Howard Street had lost them considerable traffic, and the erection of the double-storey sheds along the line of docks had closed many of the vistas of the docks which were so attractive to visitors travelling by the line. It was somewhat remarkable that with the serious competition of the Corporation tramways and the electrical service on the Lancashire and Yorkshire Railway they had been able to hold their traffic so well. In 1902 the total traffic was 8,315,000; last year it was 8,915,000, showing an increase of 600,000 passengers, but in consequence of the reduction made in the fares these 600,000 more passengers were carried for £722 less money—in other words, while the traffic increased the revenue fell from £68,179 to £67,457. Working this down to ascertain the value per passenger, in 1902 each passenger gave them 1·92d. and last year only 1·77d. If they had carried last year's traffic upon the basis of the fares charged in 1902, they would have received an increased revenue of £5,571, and it should be remembered that in this interval they had introduced an accelerated service, which added considerably to the working expenses. The loss of revenue was chiefly due to the workmen's traffic. They carried last year 3,257,000 workmen, as against 2,739,000 in 1902 (an increase of 518,000), and received £1,461 less money, and the value per passenger went down from 1·66d. to 2·29d. As the workmen's traffic was more than half their traffic, the question of its value required their careful consideration. He was doubtful if the workmen's traffic paid the actual cost of conveyance, to say nothing of the cost of maintenance and interest upon capital. As to the reduction of expenses, their powers were very limited. They had to maintain a rapid service on a line less than seven miles in length, they had the cost of 17 stations, and, unlike an ordinary line which, once made, required no upkeep beyond the permanent way, their railway had to be painted from end to end every three years, and the structure itself required periodical examination, and the renewal of parts showing any wear or tear. Comparing their cost of working per train-mile with the London electric railways, they would find that their own expenditure, deducting the renewal and contingent fund, was last half-year 14·84d. per train-mile; on the City and South London, which most closely resembled the Overhead line, it was 14·16d., and on the Central London it reached 31·71d. Their locomotive expenses were 5·39d. per train-mile, the City and South London 4·68d., and the Central London 8·80d., and the traffic expenses worked out at 5·09d., against 6·27d. on the City and South London, and 10·93d. on the Central London. Where they compared unfavourably was in the revenue per train-mile. While they made 18·73d., the City and South London earned 30·59d., and the Central London Railway 61·18d. The directors' efforts to effect economies were unceasing. Every item of expenditure was continually and closely scrutinised, and they were satisfied that the success of the line could only come from an increased revenue.

A Shareholder asked whether the 15 intermediate stations could not be done away with and the fares collected as on ordinary street tramways.

The Chairman said that had been under consideration, but it had been decided that with such a large issue of return tickets and through bookings in connection with the Lancashire and Yorkshire Railway Co., it was impossible.

In reply to another inquiry, the Chairman said that the Overhead Co. generated power at a lower cost than any other generating station in the country.

A question was asked as to the possibilities of connection with the Cheshire lines. To this Sir William replied that something might be done in that direction, but at present the company had no proposal before them. Replying to a question as to whether there was any probability of a subsidy being obtained from the Dock Board, the Chairman said that he did not know of any present prospect. He wished they had originally stipulated for such a thing; but it was easy to be wise after the event.

The motion for the adoption of the report and accounts was then carried.

The election of Mr. G. D. Killey, as a director, was confirmed, a protest by a Shareholder against the number of directors finding no support.

Edmundson's Electricity Corporation, Ltd.

The eleventh ordinary meeting of the above company was held on August 6th at Salisbury House, E.C., under the chairmanship of Mr. P. Debell Tuckett.

The Chairman, in moving the adoption of the report (see Electrical Review, page 185), said that in the profit and loss account a reduction was shown in the trading profit as compared with last year. This was accounted for, partly by the smaller turnover consequent upon the completion of the various works, partly by certain special charges having been borne by the trading account this year, and partly by the fact that the local authority losses had this year been charged directly against this profit instead of against reserves as previously. Interest on loans and dividends on investments was, however, the item on which they naturally and properly concentrated attention, and if it were not that the board were able to look behind their accounts to those of the local companies wherein lay the real strength or weakness of the position, the disclosure of the reduction in the amount of this item would be profoundly disquieting. As it was, with the explanation he would give, there was no occasion for them to entertain any anxiety on this head. On the contrary, it should be a source of satisfaction to them to feel that they were not afraid to neglect mere appearances, but had used their influence with the local companies to encourage them to make additional depreciation provision of over £12,000, of which over £10,000 would have come to Edmundson's had it been distributed instead of being so set aside. On a strict comparison with last year there was, therefore, an actual net gain of over £4,000 in the profits from this source instead of the decrease of £5,619 shown in the accounts. By way of illustration of the process which had resulted in showing this decrease, he might instance the case of the Isle of Wight Co., in which they held £100,000 ordinary share capital. On that holding they received in the previous year a dividend of 1½ per cent. or £1,500. This year, although the profits had increased by £1,200, no dividend had been paid, the whole of the £2,700 having been added to the provision for depreciation. A similar procedure had been followed in the case of the other companies. Instead of maintaining or increasing the amounts of their distributions, they had increased the amounts of their contributions for the purposes of reserve and depreciation, and in thus acting they enhanced their company's credit and strengthened their position no less than their own. On the debtor side of the account, debenture stock interest had increased by £428 12s. 2d., the last issue of stock not having borne quite a full year's interest in the previous year. The administration expenses had increased by £475 15s., but having regard to the fact that three items, aggregating £1,936 14s., did not appear in last year's accounts, he thought the substantial decrease of £1,460 19s. shown in the other items was most satisfactory, especially as it followed on a decrease last year of £4,516. It was, however, a question whether they would be able to maintain the full extent of these reductions, for he was inclined to think that they had been carried to a point at which they involved some sacrifice of efficiency. The three special items to which he referred were directors' fees, £600, committee's expenses, £988, and legal expenses, £349. The committee's expenses were, of course, exceptional. They represented the cost of the professional services rendered by the engineer, lawyers and accountants who assisted the committee in their labours of investigation, and although the amount might possibly appear large, he believed no money was ever better spent. There was no question but that the position of the company was an extremely critical one, which might easily have resulted in their losing every penny they had in it, and the more he realised the position the more he felt how greatly they were indebted to the members of that committee for their painstaking examination of the difficult problems with which they had to deal, and for the wise conclusions to which they came. The solution might not be perfect, but it was workable and effective, and in many respects the position was already very much more satisfactory than it was. Much had been done to improve the methods on which the business was conducted, and although much necessarily remained to be done, he hoped, now that the financial position had for the time being been secured, that they would be able to concentrate

their attention on the many details which still required attention. In the balance-sheet, sundry debtors had increased by £38,000, mainly due to an item of £27,000 owing by the Lancashire Power Construction Co., and it was partially balanced by a corresponding item of £23,000 owing to the sub-contractors of that company and included in the item of sundry creditors on the other side. Investments and advances to subsidiary companies stood at £1,409,774 as against £1,450,700 for the previous year, and that was principally due to the reduction in the amount of the advance to the Urban Co. consequent upon the last issue of debenture stock by that company. To a substantial extent, however, it was due to the application of amounts, set aside for depreciation, to capital purposes in relief of the capital which they should otherwise have had to find. The reserve had been increased by £1,491 from £182,073 to £183,564. On the debtor side, sundry creditors, £40,441, was some £11,000 up on last year, and this was accounted for by the cross entry in connection with the Lancashire Power Construction Co. Provision for bad and doubtful debts, £1,371, was largely a book entry in connection with their advance to the Scarborough Tramways Co., on which for purposes of account interest had been charged, although it had not been earned. The balance of £2,610 from profit and loss account had been added to last year's balance and carried forward for want of any specific purpose to which to apply it at the moment. The loss on working the local authority undertakings was £295 greater than last year owing to the decreased profit realised at Cromer, Dorking and Frome, and to the increased capital charges which had had to be met in the case of Hamilton. Dorking was likely to do somewhat better during the current year, and they anticipated a steady improvement at Hamilton and Surbiton, but he regretted to say the prospects at Cromer and Frome were very discouraging. The actual loss in the case of these towns was brought about owing to their obligation to provide not less than 6¼ per cent. by way of interest and sinking fund on the capital provided by the respective local authorities, so that as they earned less than 3 per cent. in the case of Cromer and Frome, and little more than 3 per cent. in the case of Hamilton, and in no case as much as 6¼ per cent., it followed that there was a very substantial deficiency to be made good. On the other hand, they must not lose sight of the fact that they made contracting profits out of these towns, which went some way towards eliminating the losses. The Urban Co. guarantee was less by £32, and but for a special reserve provision of £1,612, the amount would have been further reduced to that extent. For the current year he would be disappointed if the amount of this item was not substantially reduced. Turning to the schedules, they would see that the proportion of shares and debentures had largely increased, whilst the amount of the advances had decreased, and the item of investment in the Guernsey undertaking had disappeared. Their interest in Guernsey now appeared in the form of shares and debentures of that company, the remaining increase in the amount of the debentures occurring in the case of the Isle of Wight Co. The decrease in the advances to the Isle of Wight Co. and the Urban Co. resulted from the issue of debentures by those companies. The other schedule showed the total capital expenditure of all the subsidiary companies to have been £69,065, as against £92,760 for the previous year, whilst the gross profits had increased by £9,433. Particulars of these profits were given for each of the separate undertakings, and he regretted to say there was an actual reduction shown in the case of five of them as compared with last year, viz., Scarborough, Ilfracombe, North of Scotland, and the three local authority towns of Cromer, Dorking and Frome. In the case of the Scarborough tramways, the decrease was due partly to the reduced traffic receipts consequent upon the extremely unpropitious weather experienced last year, and partly to the increased cost of repairs and renewals, but, he was sorry to say, he could hold out no encouragement that the prospects of improvement in the case of this undertaking were anything but poor. They had recently investigated the position with some care, and were satisfied that they could do little to alter it. In the case of the other undertakings, speaking generally, the decreases were attributable to dearer coal; writing down of stocks of wiring goods and fittings; and writing off of losses sustained in connection with the dismantling of free wiring. The Lancashire Power Co. had not yet turned the corner, since for the year ended December 31st last the accounts showed a loss of £3,777, but there was reasonable ground for hoping that before long it would be in a position to show a substantial profit. There was no doubt that for some time the company had been seriously hampered in its development of the business by want of necessary capital, but after protracted negotiations this difficulty appeared likely to be overcome. A solution had been found in the creation of £300,000 5 per cent. first mortgage debenture stock and £100,000 4 per cent. income bonds, of which £150,000 of the 5 per cent. debenture stock would shortly be offered *pro rata* to the shareholders, with 50 per cent. of the income bonds as a bonus. The income bonds would rank ahead of the shares both as to principal and dividend, but the dividends were to be non-cumulative and payable out of profits only. The "A" shares, which were already preferential as to capital, as compared with the "B" shares, were in future to be preferential as to dividend. They were to receive a 5 per cent. non-cumulative dividend before the "B" shares ranked for dividend, and, after the "B" shares had received a similar dividend, any balance of profits was to be divided equally. The present capital consisted of £180,000 in "A" shares, and £120,000 in "B" shares, or £300,000 in all, of which they held £30,800 in "A" shares and £55,000 in "B" shares. The *pro rata* allotment of the new capital was therefore in the proportion of 50 per cent. to the old, and the amount they should thus have to find would be £42,900. The company at present owed them approximately £10,000, and in order to enable the scheme to go through, the board had agreed to find a further £17,500, leaving certain other interests to take up the balance of £15,400 to which they were entitled. Whether they were wise in agreeing to put further money into that concern was a matter of opinion upon which some differed. It, at any rate, involved a serious and anxious responsibility which they would much rather have avoided, but either they had to abandon the £85,000 already sunk in the undertaking, or they were compelled to come in to the extent of this minimum amount which he had mentioned. The board was to be reconstituted, with Mr. Parshall as chairman, and Mr. Parshall estimated that the £150,000 additional capital would put the company in a strong financial position, and would enable it within approximately the next two years to earn a net profit of over £18,000. It was no doubt easy enough to arrive at profits by estimate, but Mr. Parshall was an engineer of large experience and high standing, familiar with the station, with the district, and with the problems involved, and he was hardly likely to have staked his reputation on the success of his conduct of the business, as he undoubtedly was doing, unless he clearly saw his way to a realisation of the results he anticipated. The chairman proceeded to deal at considerable length with the creation and recent issue of prior lien debenture stock, and, referring to the provision that all profits earned prior to March 31st, 1911, were to be applied to capital purposes, said the board were determined not to jeopardise the future by issuing dividends even in 1912 unless the position fully warranted it.

Mr. Campbell Swinton seconded the motion.

Mr. Lacey asked whether it was the intention of the company not to supply the Lancashire Power Co. with any more money than the £17,000 mentioned. He quite agreed that the Power Co. might be a flourishing company some day, but they themselves, if they kept on lending it money, might find themselves in the Bankruptcy Court before that day. They had no money to speculate with. He congratulated the directors on the attitude which they had adopted for managing the affairs of the company. He would like to know why such a large sum of money as £1,000 was spent by the Committee.

Mr. Fuller wanted to know whether the board were satisfied that the materials of the subsidiary companies were properly valued.

A Shareholder said he would like to know where the £229,000 reserve was.

The Chairman: There is no fund set apart except the security in the investments.

The Shareholder thought they would be in the same plight as the South Wales Power Co. if they did not use caution.

The Chairman, replying to these and other criticisms, said he could assure them that the board were not anxious to put further money into the Lancashire Power Co., and he had no doubt that the past directors were sorry that they could not go back on their decision, and recover the money put into it. It was admitted that it was a bad investment. There was, however, a prospect of the company turning the corner, and Mr. Parshall had expressed his opinion that if the £150,000 was raised an improvement would be shown. The full amount that the Power Co. required of them was £42,900, but the directors had stood out against that, and said they would go no further than £17,000. They would not go a penny further than that. The directors had gone into the whole question, and considered that what risks there were were warranted, and they were well assured in finding the £17,000 in the hope of recovering some of the money already sunk in the concern. He knew that power companies were not going as well as could be expected, but the opinion was that they had got a future before them.

Mr. Barber asked whether there was any prospect of their not being called upon to find more than £17,000. He would remind them of the Stock Exchange motto, "Cut a loss, and let a profit run."

Mr. Lacey said he thought the board would manage the affairs properly if left alone, but it was a question whether any outside influence was being brought to bear on them.

The Chairman remarked that he was a large shareholder and they could not have anyone to protect their interests more than he would. He did not think the outside influence had been detrimental to the company. As to the Committee's expenses, the auditors' fee had come to 500 guineas, but he thought they would consider the money well spent.

Mr. Barber: Can you give us any opinion about the Scarborough tramways?

The Chairman said they thought very badly about Scarborough tramway prospects. They were not spending any capital there. With reference to the value of stocks in former years, they had been over-estimated, but they had been written down most drastically, and if anything they were under-estimated rather than over-valued. They could not get away from the fact that the position of the company was very bad from the point of view of the shareholders, but if they would have patience and confidence in the board, they believed that in time they could pull it round. That could only be done by putting it on a solid basis.

The report was adopted.

Central London Railway Co.

Sir Henry Oakley presided on the 6th inst. over the twenty-sixth ordinary general meeting of this company held at the Holborn Restaurant.

The Chairman, in moving the adoption of the report, said that happily they had had no serious trouble. The undertaking had been completed by the construction of the line at Shepherd's Bush from

the down road round their yard into the up road, which had made their railway a continuous working one. They had established a station immediately opposite the entrance to the Franco-British Exhibition, and that had earned its living well. The expenditure on capital account had been small. The only important expenditure was the construction of the line referred to, and machinery for ensuring their working properly under all circumstances. The board had sanctioned an expenditure for machinery, which, if any part now broke down, would be more than enough to carry them on. It was money well spent, and they felt they were not on tenterhooks of failure if any unfortunate accident occurred. On the new line and station they spent £38,650; on the additional power £11,048, which would enable them to reduce their expenses. Their pecuniary position was very simple. They had about £240,000 in powers not exercised, and their expenditure on capital account was £113,000 in excess of their money. They had probably £30,000 to spend, so that they had £143,000 of liabilities to be paid out of £224,000, a margin of £81,000. But they did not want money for their present purposes, because they had a reserve which they used for their working capital. On all capital questions the board were at ease. They might, however, have to add two additional trains, but they were going to see if they could work without incurring that additional expenditure. The half-year's revenue had been brightened by the very handsome addition to their ordinary traffic in consequence of the Franco-British Exhibition. For the first four months up to the end of April there was a decline in their daily receipts and in the number of passengers carried. The traffic disappeared in the short-distance fares. The only way to meet that would have been to reduce their fares to a 1d., but there was still a large proportion of the public who paid 2d. for short distances, and they decided to test the experiment for a year without altering it. In the four months they had lost 1,034,000 passengers. On the opening of the Exhibition on May 14th things began to get brighter, and in six weeks they got 676,000 more passengers than in the corresponding period last year. They were satisfied that they had gained more by the construction of the line and the station than their competitors. There had been another development due to the through booking between their line and the other tubes. Last year they carried 2,296,000 through passengers, and that class of traffic was gradually increasing. Although they changed their universal fare of 2d. to 3d., they did so with misgivings, but it had produced in the half year £12,000. Though they were sorry for the sentimental loss of the "2d. tube" title, they were recompensed by the additional revenue they got. The result of the year was that they had £8,761 more in earnings than for the corresponding period, but that had been reduced by £181 for additional expenses. That was due to an arrangement regarding the rates and taxes with some of the parishes, by which they saved £700 or £800, so that on the whole they had available £8,576 as an addition to the net revenue. They earned per passenger 1·97d. as against 1·06d. They were not quite so well off as they hoped, for last year they brought in £14,000, this year only £10,000, so that the result was that their divisible money was reduced by £4,000. The net balance would permit of a dividend being paid at the same rate as last year, and the carrying forward of £29,125. as compared with £25,891 last year. They had made provision to the extent of £5,000 for the deferred stock, which was not payable till the end of the year.

Lord Rathmore seconded the motion.

Replying to a Shareholder, the Chairman said he understood the promoters of the Exhibition were endeavouring to arrange for its continuance next year, in which case the Wood Lane station would be exceedingly useful.

The report was adopted.

Lanarkshire Tramways Co.

The directors' report for the half-year ended June 30th, 1908, states that the receipts were £33,961, and the expenses £18,992. Deducting contributions payable to local authorities £1,118, interest on debentures £608, and interest on loans £118, and adding £895 brought forward, there remains a balance of £14,020. Of this £8,617 is devoted to dividend (6 per cent. per annum for the half-year) on the share capital issued prior to January 1st, 1908; £248 to dividend at the same rate on the new issue of 2,077 shares from date of payments of the instalments to June 30th, 1908, and £5,155 is carried to revenue new account. The traffic receipts have again been very satisfactory, exceeding by over £4,000 the receipts for the corresponding half-year of 1907. Although the expenses have been very heavy owing to high prices for coal and legal charges in opposition to Parliamentary Bills affecting the company's interest, the profit available for distribution, after reserving £1,118 for contributions to local authorities as compared with £621 last year, is sufficient to pay a dividend at the rate of 6 per cent. for the half-year as against 5½ per cent. at June 30th, 1907, and to carry forward approximately the same amount. The directors will, as usual, provide for depreciation when the final accounts are made up at the end of the year. During the half-year the balance of the loan from the company's bankers, viz., £7,500, has been repaid. The 2,077 shares offered to the shareholders in February last were subscribed for in full. The proceeds have been utilised in constructing the two extensions referred to in the previous report and in the purchase of seven additional cars. The directors regret that, owing to delays in passing the plans by the local authorities and late delivery of certain materials, the lines were not opened as early as anticipated. The Board of Trade inspection was to take place on August 7th. As the company's plant is already working at full load, negotiations are pending for the supply of energy in view of the above extensions, which will obviate for the present further capital expenditure on power station plant. The company's application to Parliament for an extension of time, referred to in the previous report, has received the Royal Assent. The dividend is to be paid on 22nd inst.

Chatham and District Light Railways Co.

The directors' report for the half-year ended June 30th, 1908, shows that the receipts were £19,062, and the expenses £12,433, leaving £6,628, less rent of Rochester Corporation lines, £991; interest on debentures, £1,234; interest on loans, &c., £266; expenditure on lines abandoned, £51—total £2,542; leaving, with £348 brought forward, £4,434. Of this £2,940 is absorbed by dividend at the rate of 5 per cent. per annum on the preference shares, and £1,494 is carried to revenue new account. Owing to continued trade depression in the Chatham district the revenue for the half-year has been very disappointing. The Rochester Corporation extension lines to Strood Hill and Frindsbury were opened at Easter and leased to the company. Satisfactory arrangements were made for the supply of energy for these extensions from the Kent Electric Power Co. During the half-year the loan of £2,500 from the company's bankers has been repaid. The directors will, as usual, provide for depreciation when the final accounts are made up at the end of the year.

Chilian Electric Tramway and Light Co., Ltd.

The tenth ordinary general meeting was held on Monday at the offices, London Wall Buildings, Sir Julius Wernher, Bart., presiding.

The Chairman, in proposing the adoption of the report, said he was pleased to state that there had been satisfactory developments, both in the tramway and in the lighting department. They had carried 10 million more passengers than in the previous year, and had increased profits from the light and power departments. It must, however, not be forgotten that they had more difficulties to contend with in the year 1906, and many stoppages from which they had been free in the year under review. On the other hand, they had suffered from increased expenditure. During the past year wages had almost doubled in Chile without any increase in efficiency on the part of labour, and owing to the low rate of exchange the cost of their numerous supplies, especially coal, had increased considerably, and it was only when the water-power scheme was completed that they might look forward to a large saving and to very much better results. They were not in a position to pay any dividend, and it was greatly to be regretted that the larger part of the capital remained unremunerative. The negotiations for a revision of the tariff to which he alluded last year were still being continued, and he had no doubt that they would finally come to a satisfactory arrangement. They had found it necessary again to change the management, and had appointed Mr. Carl Muller managing director, residing in Santiago. He was a man of exceptional experience and ability, who had been very successful in his past career, and they felt confident that he would be of material assistance and benefit to the company.

Sir Gerald Fitzgerald, K.C.M.G., seconded the motion, and the report was adopted.

The Tyneside Tramways and Tramroads Co.

The half-yearly meeting was held in Newcastle-on-Tyne, on 10th inst., Dr. J. T. Merz, deputy-chairman, presiding.

The directors' report for the half-year ended June 30th stated that the surplus of receipts over expenses was £3,243, which, with the balance brought forward from last half-year of £423, made a total to the credit of profit and loss account of £3,665, and after deducting interest on debentures, loans, &c., amounting to £1,209, there remained an available balance of £2,456. This profit the directors proposed to appropriate as follows:—In the payment of dividend on preference shares at the rate of 5 per cent. per annum (less income-tax), £498; in placing to the credit of reserve for renewals, depreciation, and other contingencies, thus increasing the amount to £5,500, £900; in setting aside for the reduction of registration and formation expenses, £330; giving a total of £1,728 and leaving to be carried forward £728. The decreased profit for the half-year, as compared with the corresponding period of last year, was entirely consequent upon the reduction in receipts, amounting to £1,252, against which the reduction of running expenses was only £19. This falling-off in revenue was attributable to the smaller traffic on the company's lines, caused by labour troubles and the depression in trade which had been prevalent in the district during the period. Of the unissued preference shares, 27 were applied for and allotted during the half-year, and a further 50 had been applied for since June 30th, thus leaving 890 still unissued. The consols held in respect of Parliamentary deposits had been released and were now retained as an investment of the reserve fund.

The Chairman said the principal feature in the past half-year's working was the considerable decrease in traffic, which amounted to £1,251. They would at once see, comparing that with last year, that that was almost the exact figure that represented the ordinary dividend which they paid at the corresponding date a year ago. The reduction was partly in ordinary traffic, the decrease there being £853, and partly in the holiday traffic, which represented a decrease of £398. The causes that had brought about that reduction were well known. It was, first of all, due to general depression of trade; and, secondly, to the labour troubles, which had existed for six months in this district, and

which were still going on. They would see that these troubles had not only affected the ordinary traffic, which included the workmen's traffic, but also the holiday traffic. The mileage that had been run had been almost the same as that of the last half-year. The passengers carried had been 318,108 fewer than in the corresponding half of last year, and as each passenger almost exactly represented 1d., that explained the decrease of £1,251. The receipts per car-mile were 7·89d., as against 8·8d. in the first half of last year, and the expenses were about the same as last year. They had brought forward a balance of £423, and they proposed to carry forward £728. They had written off £900, as on former occasions, to go to the reserve fund for renewals, depreciation, &c., and £330 had been set aside for the reduction of legislation and formation expenses. Of the preference shares, 2,110 had been issued to date.

Mr. J. H. Armstrong seconded, and the report and balance-sheet were adopted.

The Chairman, in answer to a question, said that, on the advice of their engineer, they proposed to accumulate £20,000 in the reserve fund. The dividend on the preference shares was approved.

American Telephone and Telegraph Co.

The gross receipts of this company's operating constituents increased $3,009,300 or 6·5 per cent. in the five months ended May 31st. About one-third of this increase was saved for interest and dividends. The operating expenses increased $1,978,700, 80 per cent. of this, or $1,581,600, being represented by increased expenditures for maintenance or added taxes. The direct cost of securing the new business was but $393,000, or 13 per cent. of the gross return. The capitalisation of the parent company is $330,484,855, the stock being held by 25,000 investors. This capitalisation, as well as the capital obligations of the subsidiary companies, is represented by property, the replacement values of which—without considering any value in rights of way, franchises or patents—are estimated at $40,000,000 in excess of the entire outstanding capital of every kind. The franchises and rights of way are in greater part permanent.

According to the New York *Electrical World*, the gross receipts of the operating companies during the past few months have shown smaller monthly increases on account of a slowing down of new construction. The increase in the number of new telephone stations installed during the first months of 1908 has been less than for several years. On the other hand, there has been a gradual weeding out of certain low grade equipment installed during the expansion of 1906. The company feels that the substitution of higher class service at a higher price has caused the gain in gross earnings. The following figures apply :—

	Gross telephone receipts.	Increase.
January	$9,607,900	$747,000
February	9,384,400	747,000
March	9,790,100	570,500
April	9,882,200	535,100
May	9,890,300	408,300

In a later issue our contemporary adds that one of the significant features of the report is that the net earnings showed marked increase. The net balance available for dividends for the first five months of the year was equal to 5·27 per cent., as against 5·25 per cent. in 1907, on $21,000,000 less capitalisation. The condition of the company is thus summarised in the report : "The current year will be one of greatly decreased figures on the score of new construction and extensions. In the last eight years nearly $352,000,000 was devoted to this purpose. The tendency to let up in expansion began early last year when the expenditure for new construction on the part of the Bell system was $30,000,000 less than in 1906. Maintenance allowances, the most vital factor in the telephone situation, continue on a liberal scale and at practically unchanged figures. In 1906 the ratio of maintenance to gross earnings was 29 per cent. ; in 1907 it was 28·7 per cent. Financial requirements have been satisfied till January, 1909, and, if necessary, it is stated that no new funding operations will be needed till 1910, when the company's note issue of $25,000,000 will become due. What is of great significance, the investment merits of the company's securities have been genuinely recognised by England and the Continent. Foreign bankers hold at least 25 per cent. of the large issue of convertible 4s."

Great Northern, Piccadilly and Brompton Railway Co.

The half-yearly meeting was held on Tuesday at Hamilton House, Victoria Embankment, Sir George S. Gibb in the chair.

In moving the adoption of the report (see Electrical Review, page 229), the Chairman said that in considering their accounts one had to remember that the company was not only a new undertaking, but it was laid in what he might call a new route. The route through which the line ran was previously very badly supplied with travelling accommodation, and that fact pointed to the probability of the growth of traffic being slow and long continued. The conditions which gave the best traffic upon the opening of a new undertaking were when the railway was located on an old-established route, because the traffic was there, and rapidly came to the new line, but when travel had to be developed along a new route, it was a long time coming, but when it did come it was likely to stop. He thought their development on the Piccadilly tube had been unusually rapid. They were only in their third half-year of working, and last half-year they had carried 17½ million passengers, an increase of 5½ millions over those carried in the corresponding six months of 1907, or an increase of 46 per cent. That, he thought they would agree with him, was a very handsome increase. Their workmen's traffic constituted 11½ per cent. of the total. The average receipt per passenger had been 1·95d. Their through traffic had developed very well. They had carried 4½ million people with through tickets—that was 25½ per cent. of their total traffic. They were able to show a slight decrease in expenditure, and they found that the equipment of the railway was lasting exceedingly well. The permanent way equipment and the car equipment were both most excellent. They were finding that the permanent way was lasting in the Piccadilly Tube better than in any London railway with which he was acquainted. It would be noticed that the Bill approved by the shareholders at the last meeting had received the Royal Assent, and the shares other than those held by the Underground Co. had now become 4 per cent. preference shares, having the guarantee of the Underground Co. behind them. They were able this half-year to declare a dividend at the rate of 3½ per cent. on the whole of the capital of the company. It was not a very large dividend, but still it was most satisfactory that they should be able to pay a dividend so soon, and he believed it was only the beginning, and that before long it would considerably increase.

Lord George Hamilton seconded the motion, and the report was adopted.

Dublin and Lucan Electric Railway Co.—The directors' report to June 30th, 1908, shows that after providing for debenture interest there is an available balance of £868, out of which the directors recommend the payment of the usual half-yearly dividend on the 5 per cent. preference shares, which will absorb £475 ; the balance of £393 is to be carried forward to next half-year.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended June 26th, 1908, were 561,055, compared with 490,743 units in the corresponding four weeks of 1908.

Official Announcements re Companies.—The following companies are to be struck off the register within three months, unless cause is shown to the contrary :—

Accumulator Syndicate, Ltd.
Californian Electric Power and Mining Development Syndicate, Ltd
New Mutual Telephone Syndicate, Ltd.
Patent Oil Fuel Burner Co., Ltd.
Penarth Tramway Syndicate, Ltd.
Priestman Oil Engine American Syndicate, Ltd.
Dorchester and District Electric Supply Co., Ltd.
Electrograph, Ltd.
Forward Engineering Co., Ltd.
Kingsbridge and South Devon Electric Lighting and Traction Co., Ltd.
"Vernon" Mechanical and Electrical Registers, Ltd.

Stock Exchange Notices.—The Committee has appointed a special settling day as under :—

Wednesday, August 26th.—British Aluminium Co., Ltd.—Further issue o 20,100 "A" 6 per cent. cumulative preference shares of £5 each, fully paid, Nos. 20,001 to 40,090 and 40,121 to 40,190.

And ordered the undermentioned securities to be quoted in the Official List :—

American Telephone and Telegraph Co.—$100,000,000 4 per cent. convertible bonds, 1936, of $1,000 each, Nos. 1 to 100,000.
British Aluminium Co., Ltd.—Further issue of 20,100 "A" 6 per cent. cumulative preference shares of £5 each, fully paid, Nos. 20,001 to 40,090 and 40,121 to 40,190.
Mexican Light and Power Co., Ltd.—$1,500,000 7 per cent. cumulative preference shares of $100 each, fully paid.

Electric Supply of Victoria, Ltd.—The directors recommend a dividend of 6 per cent. (1s. 2½d. per share) on the preference shares for the past year, carrying forward £782.

Oldham, Ashton and Hyde Electric Tramways Co., Ltd.—The directors have declared an interim dividend of 5 per cent. per annum (5s. per share), less income-tax, on the ordinary shares for the past half-year.

South Metropolitan Electric Light and Power Co., Ltd.—The transfer register and register of preference shareholders will be closed from August 18th to 31st for preparation of warrants for the interim dividend for the half-year ended June 30th, 1908.

Electrical Securities and Equipment Co.—The annual meeting of this company was held on Monday at Dashwood House, Broad Street. The proceedings were private, and a request by a representative of the Electrical Review for a copy of the annual report, met with a refusal.

Oxford Electric Co., Ltd.—The directors have declared an interim dividend of 5 per cent. per annum (2s. 6d. per share), free of income-tax, on the ordinary shares for the past half-year.

Charing Cross, Euston & Hampstead Railway Co.—The half-yearly meeting of this company was held on Tuesday at Hamilton House.

Mather & Platt, Ltd.—The directors have declared an interim dividend on the ordinary shares of 5 per cent, free of income-tax, for the half-year to June 30th, being at the rate of 10 per cent. per annum.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	£*	No. of wks.	Total to date. £	£*	Route miles open.	Inc.
†Aberdeen	Aug. 5	1,688	+ 57	9	15,319	+ 10	14·4	..
Ayr	,, 8	1,060	+ 191	12	5,036	— 79	8	..
Bath	,, 5	2,185	+ 389	31	22,462	— 1,008	18	..
Belfast	,, 7	7,509	+ 83	19	63,629	— 847	37	..
Birkenhead	,, 9	2,344	— 161	19	20,613	+ 611	13·52	..
Birmingham Corp.	,, 1	12,534	+ 359	18	113,979	+ 5,533	56·46	..
†Blackburn	July 29	1,162	+ 56	18	21,283	+ 1,130	14·13	..
Blackpool Corp.	Aug. 6	5,098	— 253	..	23,539	+ 1,004	11·87	..
,, —Fleetw'd.	,, 8	3,601	— 197	5	7,895	— 548	8·25	..
Bolton	,, 9	5,037	— 487	19	45,516	+ 1,156	26	..
Bournemouth	,, 5	4,482	— 480	18	31,065	— 1,661	21·72	..
†Bradford	July 25	4,923	— 50	17	80,564	+ 579	54·9	1
Brighton	Aug. 9	3,426	+ 467	19	18,669	+ 623	9·5	..
Bristol	,, 7	12,470	+ 274	..	..	..	12·21	..
Brit. Elec. Trac. Co.								
Airdrie	July 31	288	+ 8	30	6,735	+ 89	3·65	..
Barnsley	,, 31	369	+ 26	,,	5,260	+ 332	..	..
Barrow	,, 31	645	— 8	,,	7,338	— 174	5·87	..
Cavehill	,, 31	222	— 5	,,	2,721	+ 138	..	..
Devonport	,, 31	1,001	+ 46	,,	13,622	— 1	8·85	..
Gateshead	,, 31	2,054	— 8	,,	30,354	+ 281	11·25	..
Gravesend	,, 31	488	— 61	,,	6,269	— 895	6·5	..
Greenock	,, 31	1,342	— 97	,,	15,894	— 4,065	7·25	..
Hartlepool	,, 31	693	— 5	,,	7,133	— 1,315	6·72	..
Kidderminster	,, 31	305	+ 16	,,	3,280	— 122	..	..
Leamington	,, 31	435	+ 75	,,	4,889	+ 318	3	..
Merthyr	,, 31	434	+ 26	,,	6,301	+ 77	2·9	..
Metropolitan	,, 31	13,108	+2,801	,,	167,962	+33,573	22	..
Middleton	,, 31	838	+ 10	,,	10,906	+ 388	8·5	..
Mid. Joint Com'tee	,, 31	11,705	+ 60	,,	172,486	— 552	..	..
Oldham—Ashton	,, 31	1,222	— 68	,,	17,907	— 86	9·13	..
Peterborough	,, 31	290	+ 14	,,	3,754	+ 91	5·31	..
Potteries	,, 31	3,676	— 62	,,	54,968	— 493	29	..
Rothesay	,, 31	1,625	+ 555	,,	5,843	— 287	2·75	..
Southport	,, 31	741	— 20	,,	8,345	— 378	3·17	..
S. Metropolitan	,, 31	1,892	+ 86	,,	23,657	+ 681	..	..
Swansea	,, 31	2,059	+ 39	,,	27,697	+ 1,855	5·5	..
Tynemouth	,, 31	796	— 12	,,	6,414	— 494	3·75	..
Weston-s-Mare	,, 29	643	+ 33	,,	3,269	— 14	3	..
‡Worcester	,, 31	656	— 3	,,	8,224	+ 33	5·75	..
Wrexham	,, 31	225	— 3	,,	3,030	+ 13	..	..
Yorks. Wool. Dist.	,, 31	2,147	— 21	,,	27,617	— 1,148	17	..
Miscellaneous	,, 31	471	— 40	,,	6,058	— 492	..	..
Burnley	Aug. 8	2,844	+ 112	..	..	..	7·5	..
Burton-on-Trent	,, 9	652	+ 37	19	5,280	— 413	6·5	..
Bury	,, 9	2,514	+ 137	18½	23,087	+ 1,920	10·5	..
Cardiff	July 18	4,582	—2,196	16	34,911	— 934	..	..
Carlisle	Aug. 8	437	+ 23	32	5,496	+ 19	..	..
Chatham and Dist.	,, 6	2,157	+ 263	31	23,454	+ 753	14·37	1·53
Cork	,, 6	1,100	— 3	31	14,210	— 481	9·89	..
Croydon	,, 7	3,444	+ 93	19	28,047	+ 244	11·25	..
Darlington	,, 8	432	— 25	19	3,818	— 269	..	..
Darwen	,, 7	491	— 10	35	4,579	— 19	4·36	..
Dover	,, 3	623	+ 82	18	4,188	— 83	4·75	..
Dublin	,, 7	12,721	—2,982	..	32,465	+ 8,514	54·25	5·5
Dundee	,, 5	2,574	+ 372	11½	14,615	+ 1,114	14·5	..
East Ham	,, 8	2,020	— 70	19	16,557	— 928	7·75	..
Exeter	,, 7	882	+ 7	19	6,160	— 131	5·5	..
Glasgow	,, 8	32,767	—1,354	10	170,232	+ 1,467	89·25	1
Hastings	,, 6	3,345	— 84	..	..	..	..	..
Huddersfield	,, 8	3,555	— 242	19	31,197	+ 407	28·5	·5
Hull	,, 8	5,216	+ 67	19	45,811	+ 201	18	..
Ilkeston	,, 5	345	+ 1	18	2,668	+ 49	3·5	..
Ipswich	,, 8	1,116	+ 62	19	7,835	— 100	10·5	..
Kilmarnock	,, 1	419	— 20	11	1,833	— 158	4·25	..
Lan'kshire Trm Co.	,, 6	2,865	— 46	31	40,265	+ 3,790	15·82	..
Lancashire United	,, 5	3,130	— 10	31	41,204	+ 2,023	39	1
Leeds	,, 1	13,702	+ 111	18	121,628	+ 5,604	96·75	·25
†Leicester	,, 8	2,715	— 89	..	..	..	..	..
Leith	,, 1	1,996	+ 176	11½	6,485	..	6	..
Liverpool	,, 1	22,486	— 768	31	328,841	— 3,278	104	..
‡L.C.C.	July 25	71,707	+5,188	14½	580,704	+63,047	119·5	6
London United	Aug. 8	19,149	+1,129	..	208,978	+ 3,848	..	..
†Lowestoft	,, 1	373	+ 9	44	7,777	+ 157	3·5	..
Manchester	,, 8	33,873	+2,591	19	290,344	+12,842	89·5	11
Newcastle	,, 8	7,805	— 565	19	74,602	— 4,929	..	..
Newport	,, 1	1,410	+ 14	18	12,256	— 818	14·5	..
Northampton	,, 7	1,266	+ 152	18½	9,123	+ 630	5·5	..
Oldham	,, 9	4 212	+ 145	20	39,701	+ 727	28·75	..
†Pontypridd	,, 8	408	+ 171	19	6,977	+ 1,863	5	1·75
Portsmouth	,, 8	6,019	+ 417	19	39,997	+ 460	14·5	..
Preston	,, 5	1,532	— 61	..	..	..	..	..
Reading	July 30	1,367	+ 108	17	11,055	+ 274	13·25	..
Rotherham	Aug. 6	1,336	— 9	18½	11,383	+ 187	10	·66
Salford	,, 10	10,110	+ 395	19	91,575	+ 1,063	38·9	..
†Sheffield	,, 2	5,774	+ 139	18½	105,406	+ 165	36·25	·5
†Southampton	,, 5	1,509	+ 58	18	12,509	+ 1,562	..	..
Southend-on-Sea	,, 5	1,560	+ 99	19	8,868	+ 658	..	..
Sunderland	June 28	2,526	— 773	13	15,009	— 3,869	..	..
†Swindon	Aug. 5	190	— 32	..	..	..	4·4	..
Tyneside	,, 5	1,014	— 48	5	2,284	— 211	3·27	..
Wallasey	,, 8	2 280	— 12	18½	17,531	+ 818	3·73	·22
†Walthamstow	,, 1	775	+ 107	18	12,111	+ 977	9	..
West Ham	July 30	4,539	— 227	18	40,421	— 2,458	14·7	..
Wolverhampton	Aug. 5	1,877	— 98	18	16,079	— 946	12·5	..
Baker St.-Waterloo	,, 8	5,370	+ 985	6	17,470	+ 2,920	4·25	1
Cen. London Rly.	,, 8	13,152	+4,057	6	42,958	+12,074	5·77	..
Char. +, Eus. Hamp.	,, 8	6,715	+1,385	6	19,915	+ 4,140	7·75	..
City & S. Lon. Rly.	,, 9	5,830	— 300	6	17,542	— 1,345	7·3	1·06
Dublin-Lucan Rly.	,, 7	378	+ 14	5	878	— 96	7	..
G.N. and City Rly.	,, 8	2 486	— 534	6	7,948	— 1,830	3·5	..
G.N., P'dy. & Brmtn.	,, 8	9,295	— 1,825	6	30,470	+ 5,910	9·25	·25
L'pool Overh'd Rly.	,, 9	3,131	— 704	6	8,990	— 1,660	6·8	4·8
Mersey Railway	,, 8	3 512	+ 65	6	11,141	+ 85	4·5	..
Metropolitan Rly.	,, 9	90,365	+1,548	6	95,185	+ 3,220	24·5	..
Met. District Rly.	,, 8	16,918	+2,690	6	53,918	+ 7,734	24	..
Anglo-Argentine	,, 5	46,688	+13,796	32	599 030	+88,398	43	..
§Auckland	July 17	11,910	+1,742	28½	82,573	+ 8,873	20·92	1·72
Bombay (B.E.T.)	,, 16	4,378	+ 544	28	66,883	+13,038	..	..
§Brisbane	July	14,026	+1,251	..	..	..	..	..
†Buenos A. & Belgr'o.	July 1	3,664	+ 507	26	93,675	+ 1,116	..	..
Calcutta	Aug. 8	6,249	— 22	..	..	..	..	..
§Geneva	June	8 804	+ 464	..	..	..	..	..
§Kalgoorlie, W.A.	July	3,674	..	..	26,729	..	20·5	..
Madras	July 31	1,221	+ 83	30	17,492	+ 1,582	12·76	..
Montevideo	June	16,519	+2,597	32	160,490	+24,453	..	..
†Perth (W.A.)	Aug. 7	2,592	— 81	32	44,406	— 876	25·48	..

Compared with the corresponding period of 1907. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Evening.

Here and there the Stock Markets give evidence of better prices and better business. This sentiment is more apparent amongst speculative issues, the investment markets remaining somewhat dull and inanimate, because of the weakness in Consols. The Home Railway section has become infected with fresh flatness, in consequence of the July Board of Trade returns showing a heavy decrease in imports and exports alike. July last year was a bumper month so far as the country's trade was concerned, and the figures for the month just over compare favourably enough with those for the same period two years ago, although this comparison carries no weight with the markets.

The exports of electrical goods and apparatus stand out in solitary grandeur as the only exception to the rule of decreases observed in the July trade returns. Copper, the metal, has been mounting steadily in price for several weeks past, ostensibly upon the great demand for it in electrical trade circles. The group of American "bosses" controlling the metal market may know more about the real reason for the advance than electrical companies do, but the popular explanation has served admirably, and copper is being talked considerably higher. Other metals, of course, have sympathised to some extent in the movement.

Dreariness and apathy have again settled upon the Home Railway market. Not one of the various departments into which the market is divided can be called strong. A batch of excellent reports from the three latest Tube companies has been published, and Piccadilly 4 per cent. Debenture at 91 is rather firmer. Charing Cross Debenture remained at 82½, the company's report naturally showing least marked progress of the three undertakings. Bakerloo Debenture is steady at 92. No change marks the Underground Railways profit-sharing notes; the price is dull at 41.

Other Tube railway issues are inclined to droop. Great Northern and City Preferred fell to 15s. upon the very drab outlook at present apparent. Metropolitan Consolidated at 36 has lost 1. For this the brilliant weather of last week was held in some degree responsible, but since omnibus issues are also depressed a more likely cause is to be found in the general public disinclination to buy Home Railway stocks.

Central London Deferred has fallen 1, while City and South London shows no recovery.

A rise of 2 in British Columbia Preferred is balanced by an equal fall in the Deferred stock. The "Canadian" group continued strong and animated. Rio de Janeiro Tramway, Light and Power Common shares have risen 4½ to 59, and the 5 per cent. Gold bonds are better at 89. Mexican Tramways Common stock improved to 117, and the Fives to 94. Amongst the lighting issues, Mexican Light and Power is 71¼, Canadian General 104, the Preferred stronger at 114, and Shawinigan Capital stock is 74. The 4½ per cent. Debenture stock of the last-named company has been done at 91⅜.

Shares in the home electric supply undertakings are inclined to be easier. Charing Cross, City Undertaking Preference dropped to 3½, and one seller had to take 3¼ for his shares. The company's Debenture stock, however, is 1 up. St. James's and Pall Mall Ordinary shed 5s., and City of London Preference lost 10s., while Edmundson's Debenture was marked down 2 to 61½. Only Metropolitans give any indication of firmness, and in their case the Ordinary, with a 5s. rise, have recovered twice the amount of the recently deducted dividend, while the Preference are 2s. 6d. better. The manufacturing companies' securities have barely moved, but in the engineering department Willans & Robinson Preference lost 10s., and business is marked in the shares at 55s. this week. British Westinghouse 6 per cent. prior lien Debentures are nominally about their paid-up value of 68; there is another 30 per cent. due before the scrip becomes fully paid. British Aluminium "A" Preference are slightly easier.

Speculation in National Telephone varieties has lifted the Deferred ½ to 107½, and although the estimates at which the stock will be paid off are becoming rather less sanguine; the "bulls" talk confidently of the proprietors receiving £120 for their £100 Deferred stock. The Second Preference shares have come into step with the First Preference again, hardening to 11, and the 4 per cent. Debenture has further improved. Other telephone shares are quiet, and the Telegraph section shows several rises in the prior-charge issues. Anglo-American Deferred picked up sharply; Direct United States rallied after their decline, and Eastern Ordinary continues to march upwards. None of the Trust companies' stocks or shares have changed, and Callender's, Henley's, and Telegraph Constructions are without movement.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations August 4th.	Closing Quotations August 11th.	Business done week ended August 11th, 1908. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	1⅞ — 2⅜	2 — 3	..	..	..	Nil
143,300	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	86 — 89	87 — 90	..	..	+1	5 11 1
$131,551,400	American Telephone & Telegraph, Cap. Stock	$100	7½%	7½%	8 %	8 %	123 —127	123 —127	..	..	..	6 6 0
$3,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	89 — 92	89 — 92	..	..	..	4 7 0
598,180	Anglo-American Telegraph	Stock	2⅜%	3½%	3¾%	3½%	56 — 59 xd	57 — 60	59	57	..	5 18 8
2,200,910	Do. do. do. 6 % Pref.	Stock	5½%	6 %	6 %	6 %	102½—103½ xd	102½—103½	103½	102½		5 15 11
2,200,910	Do. do. do. Deferred	Stock	Nil	1½	12½	1 %	15½— 16½	16½— 16½	16½	15½	+1½	5 18 6
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	101 —104	101 —104	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	7½— 8½ xd	7½— 8⅝	..	..	+ ⅛	4 15 5
2,383,276	Commercial Cable Sting. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	83 — 86	83½— 86½	85½	..	+ ½	4 12 6
16,000	Cuba Telegraph	10	5 %	5 %	5 %	6 %	7½— 8½	7½— 8½	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	15½— 16½	15½— 16½	..	..	..	6 1 9
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3½	..	..	..	6 8 1
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 11 1
30,000	1882 Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —103	100—103	..	..	..	8 14 10
60,710£	Direct United States Cable	20	3½%	4½%	4⅝%	4½%	13½— 13⅝	13½—13⅝	13½	..	..	6 4 9
50,900£	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	98 —100	99 —101	..	..	+1	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	133 —136	134 —137	136	133	+1	5 2 2
2,000,000	Do. 8½ % Pref. Stock	100	8½%	8½%	8½%	8½%	83½— 85½	84 — 86	85	84	+ ½	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red.	Stock	4 %	4 %	4 %	4 %	101 —103	101½—103½	102½	102½	+ ½	3 17 4
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12½— 13	12½— 13	13	12 13/16	..	5 7 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	99½—101½ xd	99½—101½	..	..	..	3 18 10
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4 %	4 %	4 %	4 %	99 —101 xd	99 —101	..	..	..	3 19 3
200,000£	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100½—102½	..	..	+ ½	3 18 1
181,127	Globe Telegraph and Trust	10	5⅝%	5½%	5½%	5½%	10½— 10⅝	10½— 10⅝	10 11/16	10 7/16	..	5 11 2
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13½— 13⅝	13½— 13⅝	13⅝	13⅜	..	4 7 8
150,000	Great Northern Telegraph, of Copenhagen	10	24 %	24%	20 %	20 %	27 — 29	27 — 29	..	..	..	6 17 11
19,600£	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	98 —100	99 —101	..	..	+1	4 9 1
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	56 — 59	56 — 59	..	..	..	6 7 1
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	69 — 73	69 — 73	..	..	..	5 9 7
$50,000,000	Do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	69 — 73	69 — 73	..	..	..	5 9 7
364,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	⅜ — ½	⅜ — ½	..	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	3⅛— 1⅜	3⅛— 1⅜	..	..	..	5 10 4
86,492	Do. do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	¹³/₁₆— ¹⅞	¹³/₁₆— ¹⅞	..	..	..	5 6 8
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	106 —108 xd	106½—108½	107½	107¼	+ ½	5 10 7
3,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	115½—117½ xd	115½—117½	117½	116⅝	..	5 2 2
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10 — 12 xd	10 — 12	..	..	..	5 0 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	5 %	5 %	9½— 11½ xd	10 — 12	..	..	+ ½	4 3 4
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5½— 5⅝ xd	5½— 5⅝	5⅝	5 5/16	..	4 6 11
2,000,000	Do. do. 3½ % Deb. Stock Red.	Stock	3½%	3½%	3½%	3½%	98 —100	98½—100½	98½	..	+ ½	3 7 8
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102 —104	102½—104½	104½	103	+ ½	3 16 7
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid	1	6¾%	7 %	7 %	8 %	1 1/16— 1 3/16	1 1/16— 1 3/16	23/9	..	..	6 1 11
50,000	Do. do. do. 6 % Cum. Pref.	1⁄	6 %	6 %	6 %	6 %	1⅛— 1¼	1⅛— 1¼	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock	100	..	4 %	4 %	4 %	88 — 91	89 — 92	..	..	+1	4 7 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	97 —100	98 —101	..	..	+1	3 19 3
11,889£	Reuter's	8	5 %	5 %	5 %	5 %	7⅛— 8¼	7⅛— 8¼	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	98 —101	99 —102	..	..	+1	4 8 3
8,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6½— 7xd	6¼— 7	6⅞	6 5/16	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅜— 4⅝	4⅜— 4⅝	..	..	..	5 8 1
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	Nil	Nil	2½%	2½%	1⅜— 1 7/16	1 6/16— 1 7/16	..	..	..	4 8 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980	10	7 %	7 %	7 %	7 %	13½— 14½	13½— 14½	14	13 13/16	+ ⅛	4 19 8
800,000	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½—101½	100 —102	101	100½	+ ½	3 18 5
88,521	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	3/16— 5/16	3/16— 5/16	..	..	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8 — 8½	8 — 8½	8⅛	8	..	7 1 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6	8¼ — 9½	8½ — 9½	..	..	..	2 9 0
80,000£	D do. 5 % Debs., Nos. 1 to 1,800	100	5 %	5 %	5 %	5 %	99 —102	100 —102	..	..	+ ½	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

890,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	8 %	9 %	8⅜— 8⅞	8⅜— 8⅝	8⅞	8 11/16	..	5 1 5
260,007	Do. 6 % Cum. Prefs., 1 to 260,007	5	5⅛%	5⅛%	5⅛%	5⅜%	6¼— 6⅜	6¼— 6⅜	6 5/16	6¼	..	4 10 2
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	141 —146	141 —146	..	..	..	4 2 2
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock	100	5 %	5 %	5 %	5 %	103 —106	103 —106	..	..	..	4 14 4
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	20 %	3½— 3⅝	3½— 3⅝	75/8	7 13/16	..	5 1 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅞— 1 15/16	1⅞— 1 15/16	..	..	..	5 18 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	2⅜— 3½	2⅜— 3½	60/-	58/9	..	10 15 4
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3½— 4½	3½— 4½	..	..	..	8 4 8
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4⅛— 4¾	4⅛— 4¾	90/-	..	— ¼	6 6 4
20,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½— 4½	3½— 4½	..	..	..	4 14 1
20,000	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	106 —110	106 —110	..	..	..	4 10 11
338,200	Do. do. 5½ % Loch Leven Debs.	100	..	..	5½%	5½%	97 —100 xd	97 —100	..	..	..	5 10 0
800,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	6 %	8 %	124 —129	122 —127	..	..	—2	6 6 0
400,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	107 —111	109 —113	111½	..	+2	4 8 6
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	104 —108	104 —108	107½	105½	..	4 12 7
800,000	Do. 4½ % 1st Mort. Debs., 1 to 6,350	40	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
288,000	Do. 4½ % Vancouver Power Debs., 1 to 2,300	100	4½%	4½%	4½%	4½%	100 —103	101 —104	..	..	..	4 7 5
220,000	British Electric Traction	10	6 %	8 %	Nil	Nil	1⅜— 1⅞	1⅜— 1⅞	30/-	..	..	Nil
188,801	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	4¼— 4¾	4¼— 4¾	88/0	86/3	..	6 6 4
161,497	Do. do. 5 % Perp. Deb. Stock	Stock	5 %	5 %	5 %	5 %	95 — 98	95 — 98	97	96½	..	5 2 0
1,478,653	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	76 — 78	76 — 78	76½	..	..	5 15 5
528,936	British Insulated and Helsby Cables	5	8 %	8 %	10 %	10 %	6¼— 6⅝	6¼— 6⅝	6⅝	6 5/16	..	7 8 2
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6¼ xd	6 — 6¼	..	..	..	4 12 4
100,000	Do. do. 4½ % 1st Mort. Deb. Red.	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 6 9
500,000	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	4½%	93 — 98	93 — 98	..	..	..	4 11 10
312,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	7/16— 11/16	3/8— 5/8	..	..	— 1/16	Nil
400,000	Do. do. 4 % Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	43 — 48	43 — 48	..	..	..	8 6 8
1,016,353	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	9/16— 11/16	9/16— 11/16	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
50,000	Brush Electrical Engineering, Ord., 1 to 105,731	2	Nil	2½%	Nil	Nil	0 — ½	0— ½	..	..	..	Nil
105,731	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	3/16— 5/16	3/16— 5/16	..	..	..	Nil
150,000	Do. do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
125,000£	Do. do. 4½ % Perp. 2nd Deb. Stock	Stock	4½%	4½%	4½%	4½%	53 — 58	53 — 58	..	..	..	7 15 2
125,000£	Calcutta Trams, 1 to 127,610	5	8 %	8 %	8 %	6 %	5 — 5½	5 — 5½	5 3/16	..	..	5 9 1
127,610	Do. 5 % Cum. Pref., Nos. 1 to 29,330	5	..	5 %	5 %	5 %	4¾— 5¼	4¾— 5¼	..	..	..	4 15 8
30,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
850,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9¼— 10¼	9¼— 10¼	..	..	..	7 2 10
35,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5¼— 5¾	5¼— 5¾	5⅜	..	..	5 6 11
40,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	106 —108	..	..	+1	4 3 4
800,000	Cape E Trams., 1 to 491,222	1	5 %	Nil	Nil	Nil	7/16— 9/16	7/16— 9/16	4/6	..	..	Nil
491,222	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1⅛— 1⅜	1⅛— 1⅜	29/4½	28/6	..	8 0 0
450,000	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104 xd	101 —104	103	..	..	4 6 7
215,045	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	69 — 71	69 — 71	71	69½	..	4 4 6
1,898,610	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	87 — 89	87 — 89	88	..	..	4 9 11
558,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	53 — 56	52 — 55	54	..	—1	3 12 9
558,195	City and South London Railway	Stock	2¼%	1¾%	2¼%	2¼%	32½— 33½ xd	32½— 34½	32½	..	+ ½	6 6 8
1,480,000												

Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Aug. 4th.	Closing Quotations Aug. 11th.	Business done week ended Aug. 11th, 1908.		Rise + or Fall —	Present Yield per cent.
		*	1904.	1905.	1906.	1907.			Highest	Lowest.		£ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	£	2½%	2½%	5 %	5 %	1⅛ — 1⅜ xd	1⅛ — 1⅜	..	..	..	8 13 11
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	90 — 93	90 — 93	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1¼ — 1⅜	1⅛ — 1⅜	..	..	..	7 5 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1¼	1 — 1¼	..	..	..	4 16 0
282,580	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6¾%	12 — 13 xd	12 — 13	..	..	..	4 18 1
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½ xd	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	⅜ — ½	⅜ — ½	..	..	..	16 12 6
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	4½%	1⅞ — 2⅛	1⅞ — 2⅛	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	76 — 79	76 — 79	..	..	..	5 1 3
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	85 — 87	85 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	4 %	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1⅛ — 1¼ xd	1⅛ — 1¼	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7⅞ — 8	7⅞ — 8	..	..	..	6 5 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	84 — 87	84 — 87	..	..	..	4 12 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	½%	¾ — 1¼	¾ — 1	..	..	— ¼	5 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10¼ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —105	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10¾ — 11⅛	10½ — 11½	10⅞	..	..	8 13 10
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅜	5 1/16	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 — 108	106 — 108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	5 %	10½%	10 %	10 %	15¾ — 16⅛	15½ — 16½	16	15⅞	..	6 1 3
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	Nil	Nil	½%	1¼ — 1⅜	1¼ — 1⅜	..	..	..	3 14 1
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5⅝ — 6⅛	5⅝ — 6⅛	..	..	..	8 0 0
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	3 %	6¼ — 6⅜	6¼ — 6⅜	..	..	..	4 8 11
399,930	Do. do. 60,008 to 100,000	10	6 %	3 %	3 %	3 %	6¼ — 6⅜	6¼ — 6⅜	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	6¼ — 7¼	6¼ — 7¼	..	..	..	6 17 11
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	79 — 84	79 — 84	..	..	..	4 15 3
5,732,062	Metropolitan Consolidated	100	3 %	2½%	1 %	½%	36½ — 37⅛	35 — 36	37⅛	35⅜	—1½	1 7 9
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	67 — 69	67 — 69	68⅛	67	..	3 19 9
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	11⅛ — 12⅛	11⅜ — 12⅜	11⅛	11⅛	..	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	⅜ — ½	⅜ — ½	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	15/16 — 1	15/16 — 1	16/-	15/8	..	6 3 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	4 %	⅜ — ½	⅜ — ½	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅜ — ½	⅜ — ½	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	31 — 33	31 — 33	32⅛	31⅞	..	7 15 6
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	5 %	39 — 43	39 — 43	..	..	..	11 12 6
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	⅜ — 1½	⅜ — 1½	20/-	..	..	8 0 0
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	3 — 3½	2½ — 3	55/-	..	— ½	10 0 0
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	72 — 76	72 — 76	..	..	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5⅛%	5⅛%	5⅛%	5⅛%	4⅜ — 5	4⅜ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
80,181	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10%	10 %	7 — 8	7 — 8	..	..	..	6 5 0
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6⅞ — 7⅞	6⅞ — 7⅞	..	..	..	4 10 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅝ — 4	3⅝ — 4	..	..	..	6 5 0
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4⅛	4 — 4⅛	..	..	..	5 0 0
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅝ — 4	3 — 4	73/9	65/-	— ⅜	5 12 6
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	94 — 97	95 — 98	95⅝	..	+1	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3 — 3⅛	3 — 3⅛	..	..	..	6 8 7
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9½ — 10½ xd	9½ — 10½	9⅝	..	..	5 17 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	11½ — 12½	12¼	12	— ⅛	4 16 0
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2⅛ — 3	2⅛ — 3	..	..	..	3 6 8
50,000	Do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3⅝ — 4¼	3⅝ — 4¼	..	..	..	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅛ — 8⅛ xd	7⅛ — 8⅛	..	..	..	6 1 3
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10¼ — 10⅝ xd	10¼ — 10⅝	..	..	..	5 11 8
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 2 7
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	100	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	⅝ — 1	⅝ — 1	..	..	..	Nil
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	60 — 67	58 — 65	60	57½	—2	6 18 6
10,000	Folkestone, 1 to 10,000	5	5⅛%	5⅛%	5⅛%	5⅛%	4⅜ — 5½	4⅜ — 5½	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅜	5 — 5⅜	5½	5⅜	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99 xd	96 — 99	..	..	..	4 10 11
15,000	Hove, 1 to 15,000	5	8⅛%	9 %	9 %	8⅛%	6 — 6⅜	6 — 6⅜	..	..	..	6 10 9
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 11 1
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97 xd	94 — 97	..	..	..	4 2 6
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞ — 1⅛	⅞ — 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅛ — 5	4⅛ — 5	..	..	..	6 0 0
74,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4½%	4½%	89 — 92	89 — 92	90⅛	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6¾%	4⅛ — 5 xd	4⅜ — 5⅛	5 5/16	5 1/16	+ ¼	6 3 11
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅝ — 4⅞	4⅝ — 5	..	..	+ ⅛	4 10 0
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —109	105 —109	..	..	..	4 2 7
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	84 — 89	84 — 89	..	..	..	3 18 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	5⅝ — 5⅞	5⅛ — 5⅜	..	..	— ¼	6 19 2
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 13 0
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	12 — 13	12 — 13	..	..	..	5 15 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅝ — 6⅛	5⅝ — 6⅛	..	..	..	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 99	95 — 98	..	..	..	4 0 10
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7⅛ — 8⅛ xd	7 — 8	7⅞	..	— ¼	6 5 0
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6¾ — 7⅛ x	6¾ — 7⅛	..	..	..	4 16 7
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 72 xd	68 — 72	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	6 19 2
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅜ — ½	⅜ — ½	..	..	..	4 0 0
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 — 1⅛	1 — 1⅛	21/3	..	..	5 12 0
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	⅛ — 1⅛	⅛ — 1⅛	..	..	..	16 13 4
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅛ — 2⅜	1⅛ — 2⅜	..	..	..	10 10 6
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	82 — 85	82 — 86	..	..	..	5 5 11
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅛ — 8⅛ xd	7⅛ — 8⅛	8 5/16	..	..	5 17 8
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	5 — 5⅛	5 — 5⅜	5 1/32	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount 2½ per cent.. May 28th. 1908.

TRAVELLING.

[COMMUNICATED.]

It may truly be said that the progress of any industry greatly depends on the excellence and organisation of its travellers. This statement is particularly applicable to that of electrical engineering, an industry of comparatively recent growth, and one which finds itself in daily competition with its older rivals of gas, steam, hydraulic, and pneumatic power.

The question of soliciting business can be viewed either from the standpoint of the individual firm or from that of the industry in general, but many are apt to forget that the advance of either is dependent upon that of the other, and we are afraid that there is too great a tendency for manufacturers of electrical machinery to devote their travelling organisations to fighting among themselves for orders which are bound to come to the industry sooner or later, and to neglect the opening up of new avenues for the disposal of their manufactures.

To make our point clearer, let us take the case of a mill-owner or electrical contractor who intends to order a 20-H.P. motor, and obtains, say, half-a-dozen quotations from motor manufacturers. For the next week he will be pestered with visits from the representatives of these firms, some calling two or three times. Now, looking at the question from a broad view, that motor order is going to be given to one of the competing firms; the advantage to the industry has already been secured, collectively it is a secondary affair as to who actually gets the order.

Would it not have been better if those travellers, instead of expending their forces in civil war among themselves, had utilised their time in persuading other factory owners to adopt electric power? The result in the long run would be that more orders for 20-H.P. motors would flow in, with benefit to the industry generally and to firms individually.

To this question the heads of electrical concerns would answer that it was the fault of the travellers themselves, and in saying so they would be partially correct. The outside staff, rightly or wrongly, consider that to know where an order is to be given out is half the battle, and that it is better for them to spend their time over a party who is a certain buyer from somebody than over a man who, after a large amount of trouble had been taken with him, may finally decide to retain his gas engine or to equip his new factory with steam power. But all the same, too much blame must not be laid on the travellers; there is a great deal of the "What we want is orders" policy among employers, even of the Gentile persuasion, and many a good sound engineering traveller has descended into the bagman through the pernicious system of judging him solely by his weekly or monthly returns.

As a remedy, let the travelling organisations of manufacturers be divided into two portions. One—the lesser—consisting of men whose duty it is to follow up inquiries, to see that the quotation fulfils what was required, and, if possible, to get the order, but not to live on the prospective customer's doorstep; the other portion to be composed of men who are well trained as engineers, who will act as pioneers, and who will preach the benefits obtained from the use of electricity. But, for Heaven's sake, do not attempt to compare the results of the two by any weekly returns or such like; the former may be able to show a steady influx of orders every week, whereas the latter might not get one for months, but when he does so it will probably be worth more than all those which, in the same time, had been struggled for over a customer's counter.

Another evil is the growing craze for "publicity systems" or "intelligence bureaus." A firm, who hitherto have regarded their travellers as intelligent human beings, suddenly decide on a new method of following up inquiries and likely customers. A weird system of numbering quotations and a box of tricks with cross references are introduced; the result is that the travellers either become mutinous or machines. If the former, then the innovations go by the board; if the latter, then they lose all sense of personality and gradually come to regard probable customers, not as subjects on whom to exercise their wits and persuasion, but as an entry on a card surrounded by dates and hieroglyphics. Further, all this leads to the travellers being too much in the office; their place is out on the road scouting for business and not at headquarters practising the three-card trick. Also at the same time as the new methods are introduced elaborate traveller's reports are asked for. Nothing more deadening to the intelligence could be conceived; a good traveller gauges instinctively the possibilities of a firm by a series of almost sub-conscious impressions which would tax the art of a Macaulay to commit to paper.

Providing that no fault can be found with the quality and delivery of the goods, it is only necessary to get good travellers, pay them well, make it worth their while to succeed and leave them alone. Travelling is solely a matter of personality, and nobody has yet been able to produce that, or even to add to it, by a report book or a card index, which, if anything, are more detrimental than beneficial.

COMMERCIAL NOTES.

By "SEARCHLIGHT."

Our attention has recently been directed to the very unfair conditions that distinguish many of the forms of tender supplied to contractors for public works in Great Britain. Some of the worst sinners in this respect are corporation electricity works and those of urban district councils. Nor are the colonial Governments free from injustice in the specifications they offer, through their engineers, to the British manufacturers, as we shall presently show.

A careful study of the general conditions, specifications, and forms of tender supplied to contractors by the City of Sheffield (Electric Supply Department), the City of Coventry (Corporation Electricity Works), the Borough of Plymouth (Corporation Electricity Works), the Borough of Bolton (Electricity Generating Station), the Stretford Urban District Council (Electrical Undertakings), the County Borough of Salford (Sewage Works), and the Government of Natal (Harbour of the Port), clearly reveals the objections which are at once an affront to our sense of fairplay and our theory of commercial encouragement.

That such conditions are unnecessary in the interests of either of the "high contracting parties" is apparent to those acquainted with the Continental forms of tender, which may be searched in vain for any such unjust and hampering restrictions. Anyone doubting this statement may soon put it to the test by calling at the office of the Commercial Intelligence Department of the Board of Trade, 73, Basinghall Street, E.C., and inspecting personally the conditions that have been set forth for a number of recent contracts.

We have before us, as we write, a letter from a well-known contractor with works in the north of England, and offices in London. The writer says: "In dealing with two foreign forms of contract tenders we have not even been asked to put in any clause; and there has been no objectionable long form of specification and tender like there is in England." He then refers to a certain Electricity Committee and states: "They have a form of tender which is very objectionable, see p. , clause . This last clause is so stringent that we had to refuse to carry out this contract after the order had been given us."

Turning to these conditions, as issued by the Corporation, we find the following:—

"The contractor shall pay to *all workpeople in their employ* (not merely those engaged on the work of this particular contract) the regular standard rate of wages for the time being recognised by the various Trade Unions and Employés' Associations in the district in which the work is being carried out (in many instances this would mean the lowering of wage actually earned and paid), and shall also observe the hours and conditions of labour as recognised by such Trade Unions and Employés' Associations, and in case there be any default on their part, or on the part of any sub-contractor in this respect (what is a 'sub-contractor'?),

the contractors shall forfeit and pay to the Corporation the sum of £50 as liquidated damages, and *in addition* thereto the Corporation shall be entitled to refuse to accept delivery of *all* or any *portion* of the works, and to obtain elsewhere the necessary materials for, and to carry out and execute such works, according to this contract, and any sum in excess of the price stipulated herein and all damages and losses thereby sustained by the Corporation (who shall estimate such 'damages and losses?') shall be paid by the contractors to the Corporation on demand."

Certainly this clause is not only loosely constructed, and therefore open to misinterpretation, but it is also such as no self-respecting firm could accept.

Turning to the conditions and specification in a contract that we have in mind, we find a very one-sided requisition, which places the contractor completely at the mercy of the engineer, who is permitted to hold the former responsible for his own omissions, and may practically put what construction he likes on the "requirements." The clause reads thus :—

"The contractor, at his own cost and charge, is to find, provide, and do *everything* of *every kind and description*, including plant and temporary works, *which, in the opinion of the engineer*, is necessary for the due and proper execution of the whole of the works included in the contract and every part thereof, whether comprised in the drawings, specification, bill of quantities, or other documents hereto annexed or herein referred to or not, it being definitely and distinctly understood that, should anything be omitted, either in the drawings, specifications or schedules which is fitting and is usually considered necessary to be done for the completion of the work, the contractor shall execute the same as if it had been particularly specified or shown, and shall supply whatever may be necessary to complete the whole work, without any claim for payment for such omitted work."

Here, indeed, is an opportunity for the engineer to establish a reputation for "enterprise" and "smartness" at the sole expense of the contractor.

Clauses 7, 8 and 9 stipulate that the "contractor shall, to the satisfaction of the engineer, do and pay everything, and provide against and take every risk and liability which the corporation, in the opinion of the engineer, would have had to do, pay and provide against," &c. Here it is clearly shown that there is no definition as to what "every risk and liability" implies other than the "opinion of the engineer," which might be most unreasonable, inasmuch as reason will not die with the engineers.

Again, it is stipulated in Clause 8 that the contractor, and the contractor alone, shall be responsible for "any obstruction, delay or hindrance to the traffic in consequence of his operations, notwithstanding that such obstruction, delay or hindrance may be naturally incident to the performance of the contract." This stipulation places the contractor between the hammer and the anvil, and forbids him escape.

By Clause 9 it is perfectly possible for the contractor to be called on by the engineer to undertake the duty of public protector. The crucial point of the provision is the vague term "*Which the engineer may think necessary.*" Woe betide the contractor who, in the course of his business, should be so unhappy as to offend the all-powerful engineer!

Clause 11 is wholly against the contractor, inasmuch as it gives to the engineer power to upset the entire designs and yet holds the contractor responsible for the due carrying out of the original contract. Should the engineer elect to apply this clause stringently the contractor would find in addition 10 per cent. of the value of the whole contract (which might mean its entire profits) disappearing, and by Clause 12 it is concisely stipulated that he shall have no claim for extra payment beyond the contract price, unless he shall have received a written order from the engineer expressly stating that the work is to be the subject of an extra charge, &c. The engineer, therefore, having any special fads and fancies may have these carried out at the sole expense of the contractor up to 10 per cent. of the whole contract.

Passing by Clause 16 with the mere statement that it might be made to tell entirely against the contractor, we examine Clause 21, which would seem to provide for unlimited holidays on the part of the engineer at the expense of the contractor. It runs thus :—

"The engineer shall have power, by notice in writing, to delay or suspend the whole or any part of the work during unsuitable weather, *or for any other sufficient reason*, but the works shall be recommenced after receiving due notice in writing from the engineer. Such delay shall in no way vitiate or invalidate the contract; and in no case shall any compensation for damage, injury, or loss of profit or otherwise be allowed the contractor for or on account of such delay or suspension of the work."

It might be asked what is unsuitable weather? Does it depend on the engineer's preference for sunshine or snow? Again, in case the weather should be in order, the engineer is allowed "*any other sufficient reason.*" There is, moreover, nothing to prevent the engineer from suspending the work during the time that he takes a tour round the world, or perfects himself in Oriental languages, should he feel inclined. The contractor would have no redress, the time of suspension being absolutely unlimited. Cases are actually on record where work has been suspended under such a clause for over five years, and is still unfinished.

Possibly anticipating that the contractor, driven to desperation, might at least wish to abandon the contract, which, owing to the absence of the engineer, he was unable to fulfil, Clause 32 states :—"If in the opinion of the engineer the contractor shall abandon the contract or fail to perform any part of his obligations thereunder, the Corporation shall have power to determine the contract . . . . to expel the contractor and his workmen from the works," &c.

By Clause 47, which stipulates what the contractor shall pay his workmen, and the number of hours he shall work them, the municipality is clearly interfering with the law of supply and demand as it affects labour. Whether such interference is wise on the part of the municipality it is not, perhaps, wholly within the judgment of this generation to decide.

THE DIFFICULTIES OF CO-OPERATION BETWEEN MANUFACTURERS AND CONTRACTORS.

[COMMUNICATED.]

To an ordinary individual of an optimistic or Socialistic frame of mind the possibility of difficulty in co-operation would be laughed to scorn. Attention would be directed to the various wholesale and retail co-operative societies in the country, the apparently harmonious way in which the smaller societies of various towns support the wholesale co-operative firms, and the marks of success attained by co-operation in the way of bonuses and dividends.

In spite, however, of this happy view of things and the energetic efforts of such apostles of co-operation as Mr. Northcote, there exists a difference between the class of supply mentioned above and matters electrical, inasmuch as electric supplies are not required by the whole community, neither can they be dealt out in pounds or half-pounds at one fixed price.

The ordinary contractor does not care particularly whose goods he supplies, his preference lying of course in the direction of those which bring him in the best return; moreover, to suit his various customers he must perforce deal with a large variety of firms at the same time. These customers, although of small importance, require as much attention for little returns as the man placing large orders. The unfortunate point is that the man with the large order generally goes direct to the manufacturer, and gets as good, if not better, terms than if he were to deal through a contractor.

The contractor, of course, does not like this; he thinks that it is distinctly unfair treatment, but although it may

hit him particularly badly, very small blame can be attached to the manufacturer. The man who pays the piper calls the tune, and the man who places the order is in a position to indicate gently to the manufacturer that if that manufacturer will not supply except through a contractor, the order is likely to go somewhere else. If that other person, who is used as a menace, could be brought to a sense of fairness then manufacturers as a whole would be in a position to lay down the law and say that they would have their appointed agents in any particular district for the purpose of receiving every order from that district, and through whom all communications must pass; this would give a chance for the local contractor. The whole crux of the question as to whether co-operation between manufacturer and contractor is possible turns on the shocking weakness of human nature and the unfortunate fight for supremacy which continues as long as a business career lasts.

Suppose we take the case of a typical manufacturing centre. There are several contractors struggling along in the locality, but their experience is limited and their capital more so. It may happen that one of the factories of the district decides upon electrification. Is it likely that this factory is going to risk its own business by turning over the work of conversion to one of the local contractors, or for that matter, to any small outside contractor? The answer is distinctly in the negative. They are big manufacturers themselves in their own line of business, and they prefer to deal with people on an equal business footing and to order direct without delay and inconvenience, such as may very possibly result by the interposition of an intermediate local contractor.

We are entering upon an age of buying direct from the manufacturer; the daily and weekly papers are full of appeals towards this method of business, whether for a suit of clothes, a house full of furniture or a bottle of whiskey, and added to this tendency is the effect of the rapidly increasing practice of deferred payment. The same process is being repeated in the electrical sphere. Added to this is the tendency of the rapid advances being made daily in all electrical matters. These make it a most difficult matter for the contractor to keep abreast of the times in his stock, and if he can only show a prospective customer an illustration of the article in demand the said customer feels that he might just as well purchase direct as through the middleman. As an illustration of the extent to which this process has already gone, it may be mentioned that many architects now go to the extent of specifying that certain electrical fittings shall be fixed, and obtain them direct from the manufacturer through their own offices instead of going round about to the local contractor. Moreover, it is unfortunately the case in some instances that it is only the manufacturer who is willing to allow the architect the commission, who gets the order. Although the electrical contractor may feel that he has a legitimate grievance in this matter he cannot reasonably find fault with the manufacturer, as they are both alike in the fact that each must do the best for himself.

With all the present-day conveniences of telephone, telegraph, express passenger trains, parcels post, cheap rates of carriage, together with the introduction of cheaper clerical work in office staffs and easy means of filing and reference, is it to be wondered at that the contractor is not given a single thought when an order is about to be placed? A works manager who wants to get some electrical apparatus dictates a letter to the typist calling for quotations of certain articles; this is sent direct to various firms dealing in these goods; they in turn have every detail set out, so that it is only the work of a few moments to make reference and find the best price that can be quoted. This is then sent out in stereotyped form without question as to whether some intermediate dealer, such as the electrical contractor, could have carried out the transaction. Even if a contractor has some sort of agreement with the electrical manufacturing firm to represent them, how is the manufacturer to tell that the inquirer will or will not deal with that local representative? There may be a matter of strong disagreement or personal feeling between the two local parties, and it is hardly likely that an order is to be lost on that account. If the rule is to be relaxed in that particular case, why may it not be abandoned in every instance? Competition is altogether too keen, and prices are too small for any manufacturer to say that he will only deal through his recognised agents, even if he has appointed them in any particular district. The manufacturer will not refuse an electrical contractor his discount on any business that he obtains directly, and he may even advise him of prospective business, but it is absolutely necessary for him to reserve the right to trade direct, even to the extent of under-cutting local dealers in his own goods, if he feels that such a course will benefit him in the long run.

Electrical contractors are no worse off in this respect than contractors in any other trade; the same cry is raised by each in turn, that with so many unemployed eager to snatch the smallest opportunity of making a livelihood, it is possible for even the smallest manufacturer to have his army of travellers working on a commission basis and finding their way into the four quarters of the globe seeking orders.

With all these facilities at their disposal, is it to be wondered at that manufacturers will not come into line and work hand in hand with the electrical contractor or any other actor in the drama of business life?

INTERNATIONAL ELECTROTECHNICAL COMMISSION.

(*Continued from page* 238.)

Damped.—The motion of a piece of mechanism is said to be damped when any oscillations which may be started rapidly die away. If no oscillations can be produced it is said to be APERIODIC. See DEAD-BEAT.

Dash-Pot.—An appliance for preventing sudden or oscillatory motion of any portion of an apparatus by the friction of air or of a liquid.

Dead-Beat.—An instrument or other mechanism is said to be dead-beat when the oscillatory movement rapidly dies away. To be distinguished from APERIODIC.

Derived Units.—See PRACTICAL UNITS.

Dielectric.—Any material which permanently offers high resistance to the passage of electric current.

Discriminating Cut-out.—A cut-out, usually on a switchboard, for interrupting the circuit when the normal direction of the flow of energy is reversed.

Distributing Board.—A board carrying small bus-bars, used for connecting a number of circuits to a pair of mains. Sometimes called a DISTRIBUTION BOARD.

Distributing Mains.—The conductors which intervene between the feeders and the service lines, and which are collectively called "distributing network," or "low-pressure network," or the NETWORK.

Diversity Factor.—The number obtained by dividing the sum of the maximum loads of the individual consumers supplied from any works during a given period of time by the maximum load delivered from the works during the same period.

Draw-in Box.—A box used in connection with a draw-in system of mains. When complete it contains no links, fuses, or switches, but in some cases permanent joints.

Draw-in System.—A system of laying mains in which the cables or wires are drawn into pipes or DUCTS after the latter have been laid or fixed in position, in such a manner that the cables or wires can be withdrawn at any time without disturbing the pipes or ducts. Draw-in boxes, manholes or junction boxes are usually provided through which the cables or wires may be drawn in or withdrawn.

Drop (in pressure).—A difference of potential between any two points in a conductor through which a current is flowing, the conductor itself not being the seat of any electromotive force.

Drop Signal.—See ANNUNCIATOR.

Ducts.—Pipes or blocks perforated with holes through which cables are drawn. Usually non-metallic and set in concrete. The holes themselves are sometimes called ducts.

Dynamo.—A continuous-current GENERATOR.

Dynamometer.—(*a*) An instrument for measuring forces.

(*b*) An apparatus for measuring the torque exerted by a prime mover or motor.

(*c*) An instrument for measuring electric currents depending on the measurement of the electromagnetic forces between two or more cells. (Abbreviation for ELECTRO-DYNAMOMETER.)

Ear.—In overhead tramway work. A grooved metal fitting riveted over, soldered or otherwise attached to, a trolley wire for the purpose of:—

(*a*) Supporting the wire.

(*b*) Altering the horizontal direction of a trolley wire; termed a "PULL OFF."

(*c*) Anchoring a trolley wire.

Earth.—(*a*) An electrical connection with the earth, intentional or unintentional, is called an Earth.

(*b*) (Verb: to earth.) To connect any conductor with the general mass of the earth in such a manner as will ensure at all times an immediate and safe discharge of electrical energy. (Board of Trade definition of "efficiently connected with earth.")

(*c*) Earth circuit. A circuit of which the earth forms a part.

Earthed Circuit.—A circuit one pole of which is earthed at one or more points.

Earth Rail.—See Conductor Rail.

Effective Volts.—A term not recommended. See Virtual Volts.

E.H.P.—Contraction for Electrical Horse-Power.

Electrode.—A conductor by which an electric current passes into or out of an electrolyte or other substance.

Electro-Dynamometer.—See Dynamometer.

Electrolysis.—The passage of an electric current through an electrolyte.

Electrolyte.—Any substance which undergoes chemical decomposition by the direct action of an electric current passing through it.

Electrocution.—A form of capital punishment for criminals by electric shock.

Electromotive Force.—That which causes or tends to cause an electric current. Abbreviated "E.M.F." See Potential, Pressure, Tension, Voltage.

Exciter.—A dynamo used for exciting the field magnets of another machine. See Alternator.

Farad.—The practical unit of electrical capacity. It is inconveniently large, and therefore capacities are usually reckoned in Microfarads.

Factor of Safety.—The ratio of the "ultimate breaking stress" to the "maximum normal working stress."

Fault.—Any local defect in the insulation or continuity of a conductor which interferes with its use.

Feeders.—Conductors for conveying electrical energy, from the place where generated or transformed, to Feeding Points or sub-stations. Not used for supplying consumers directly, owing to the varying pressure along their length.

Feeder Box or Pillar.—(For tramways or railways.) A box or pillar containing switches, links and sometimes fuses for connecting sections of trolley wire or conductor rail with feeders.

(For electric lighting and power.) A box containing links and sometimes fuses for connecting feeders with distributing networks.

Feeding Point.—The point of junction of a Feeder with the Network.

Field, Electrostatic.—Any region in which there are electric lines of force, as in the space between a positively-charged surface and a negatively-charged surface.

Field, Electro-Magnetic.—See Field, Magnetic.

Field-Magnet.—Any magnet or electromagnet employed for the purpose of providing a magnetic field. (It is incorrect to speak of the field-magnets of a dynamo or motor as its "fields": they should be called its "magnets," if the term "field-magnets" is too long.)

Field, Magnetic.—Any region in which there are magnetic lines of force, as in the space between the poles of a magnet or within a magnetising coil. The intensity of the field is usually expressed in C.G.S. measure as the number of lines per square centimetre. One line per square centimetre is called a Gauss. See Line.

Figure of Merit—(*a*) Of a galvanometer. The deflection in millimetres per micro-ampere at a scale distance of one metre.

(*b*) The current in amperes required to produce a deflection of one millimetre at a scale distance of one metre. Sometimes expressed as the number of megohms through which one volt will give that deflection. The complete period of a swing is taken at 20 seconds unless otherwise stated.

(*c*) Of a telegraph instrument. The minimum current necessary to work the instrument with absolute certainty.

Flashing.—(*a*) Any process of manufacture involving the temporary electrical superheating of a glow-lamp filament.

(*b*) The coating of glow-lamp filaments with a layer of carbon by heating them electrically in a hydrocarbon vapour.

Flashing Over.—The temporary formation of an arc from brush to brush on a commutator.

Flash Test.—The momentary application of a high electrical pressure between two conductors insulated from each other.

Foot Candle.—The illumination produced by one candle-power falling perpendicularly on a surface at a distance of one foot.

Fourth Rail.—See Conductor Rail.

Frequency.—The number of complete periods per second of an alternating current. Symbol ~. The term Periodicity is not recommended.

Frog.—In tramway overhead work. A fitting uniting two diverging trolley wires with a single wire (*a*) provided with a spring tongue, or (*b*) pull-over tongue, or (*c*) of the fixed type.

Fuse.—The actual wire or strip of metal in a cut-out which may be fused by an excessive current.

Gauge.—(*a*) A general term applied to various kinds of measuring instruments, and to linear measurements.

(*b*) The thickness of a plate, or the diameter of a wire, on the inch, millimetre, or on any arbitrary scale.

(*c*) The distance between the rails of a railway or of a tramway. In the case of a railway it is the distance between the inner sides of the heads of the rails. In the case of a tramway it is the distance between the inside edges of the tread of the rails, *i.e.*, over and including the grooves.

Gauss.—A name given to the absolute electromagnetic unit of magnetic induction in the C.G.S. system.

Generator.—Any machine capable of transforming mechanical into electrical energy—*e.g.*, a dynamo or alternator.

Glow Lamp.—A term recommended instead of Incandescent Lamp, in order to avoid confusion with the "Incandescent Gas" mantle.

Gramme Calorie.—See Calorie.

Great Calorie.—See Calorie.

Grid.—In an Accumulator. The framework supporting the active material.

Ground.—A term used in America, having practically the same meaning as earth. See Earth.

(To be continued.)

PROCEEDINGS OF INSTITUTIONS.

Institute of Marine Engineers (Incorporated).

The Generation and Transmission of Power for Main Marine Propulsion and Speed Regulation.

By W. P. Durtnall, Member.

(Abstract of Paper read in the Congress Hall, Franco-British Exhibition, July 18th, 1908.)

A vast improvement has taken place in the method of marine propulsion since the days when the first steamship, the *Great Britain*, crossed the Atlantic. The engine of this ship consisted of two cylinders, each 88 in. diameter × 72 in. stroke, working at a steam pressure of 6 lb. per sq. in., and running at a speed of 18 R.P.M. The crankshaft was connected to the propeller shaft through a chain gear having a speed ratio of 3 to 1, so that the propeller, a six-bladed one, revolved at 54 R.P.M., and the vessel took 15 days to cross from Liverpool to New York.

Although the cylindrical marine type of boiler has done, and is still doing, good work, water-tube boilers are now being introduced. Oil fuel is also making headway, not only on account of its high efficiency, but also of the absence of dirt and cinders, the saving in stokehold staff, and the facility with which the fuel can be stored and brought to the boilers by means of pumps and pipes instead of by the manual labour of stokers and trimmers.

The recent trials on the two French battleships, *Patrie* and *Justice*, in which Niclausse water-tube boilers were used, show that boilers using oil fuel may be forced well above their normal working conditions.

As a prime mover, the steam turbine is in several ways an almost ideal motor. It is easy to open up and repair; it is specially suitable for use with high superheated steam; it has few working parts; there are no exposed lubricating surfaces; it gives a uniform torque, and is highly efficient under great variations of load. Although it has secured a very strong hold for marine propulsion, it labours under a few disadvantages, namely, in having to run at a comparatively low speed in order to permit of the use of a propeller of high propulsive efficiency, thereby increasing its weight per B.H.P. developed; necessitating also, owing to its large diameter, proportionately large blade clearance with consequently higher steam leakage and consumption per horse-power.

Another serious disadvantage of the turbine for marine work is the difficulty of reversing for manœuvring and going astern; and the low efficiency when working below full speed. The increase in the consumption of steam per horse-power developed when running at speeds below full speed is very marked. Thus, on the *Lusitania* trials the steam used by the turbines and auxiliaries was 14·46 lb. per shaft horse-power at 25·4 knots, and 26·53 lb. at 15·77 knots. Whilst this latter disadvantage is not so important on steamers making large voyages, it is a somewhat serious matter on those making short voyages, starting and stopping frequently, and manœuvring in and out of harbour several times a day, and also for ships of war when in battle or manœuvring in squadrons.

To reduce the above disadvantages, separate astern turbines have been carried, which, however, have only about one-third of the power of the ahead turbines. The disadvantages of such an arrangement from the point of view of dead weight, machinery standing idle, the impossibility of reversing at full speed, and poor economy of the reversing turbines, are obvious. It has been stated that the advantages due to increased speed on the turbine-driven channel steamers are almost entirely neutralised by the loss of time which takes place in landing.

The author then referred briefly to other methods which had been proposed to overcome these defects, such as mechanical gear, hydraulic gear, and compressed air, but these he dismissed as unpractical.

The adoption of electrical power transmission appears to solve the difficulty. By its means it is possible to take advantage of high-speed turbines, thus saving turbine weight and also securing the highest economy in steam consumption; and by using electric

motors coupled to suitable propellers, all the advantages of moderate speed large-bladed propellers could be obtained, and the control of speed and direction is more complete than is possible with reciprocating engines directly coupled to the propellers.

By means of electrical propulsion the whole of the control can take place from the bridge or other suitable position by means of motor-operated switches.

The author then briefly described the salient features of large dynamos and motors both of the continuous and the polyphase current types.

The steam consumption of large turbo-electric sets is very low. Thus a 7,500-KW. set running at 750 R.P.M. with a steam pressure of 160 lb. per sq. in. and 150° superheat, condensing into a vacuum of about 27½ in., would require about 13·5 or 14 lb. per KW.-hour, including auxiliary plant. A 2,000-KW. set running at 1,500 R.P.M. under similar conditions consumes about 15·5 lb. per KW.-hour, whilst a 500-KW. set running at 3,000 R.P.M. uses about 23 lb. of steam per KW.-hour. In the large sizes, the most satisfactory electrical machine is the low periodicity polyphase alternator, whilst the absence of commutators and brush gear on the short-circuited three-phase induction motor renders it especially suitable for marine propulsion work. It is within the range of possibility to design and construct such motors for marine work in sizes of from 1,000 to 10,000 H.P., weighing from 35 to 20 lb. per H.P. developed, and the efficiency of these for continuous rating would be from 93 to 97 per cent.

The following are the particulars of the electro-mechanical arrangements suggested by the author for a vessel fitted with four propellers, each requiring 1,000 B.H.P. The speed of the propellers would be 250 R.P.M., each coupled direct to a polyphase induction motor with squirrel cage rotor. The stator would be wound for full, half, and quarter speeds. These would be obtained by a double winding on the stator, by means of which the machines would work either as 12, 24 or 48-pole motors, giving speeds of 250, 125 and 62½ R.P.M. The generators would consist of two turbo-alternators and exciters, capable of generating together 3,250 KW. when running at a speed of 1,500 R.P.M., with steam at 150 lb. per sq. in. pressure and 150° F. superheat. They would be of the two-pole type, so that the ratio of speed reduction between them and the motors would be respectively 6 to 1, 12 to 1, and 24 to 1, depending upon the connections to the stator windings. When running at top vessel speed, the alternators would be coupled up in parallel, and the steam consumed would be 16 lb. per KW.-hour, or 13 lb. per shaft H.P.-hour. The steam consumption of steam turbines directly coupled to the propeller shaft would be more in the order of 22 lb. per shaft H.P., so that there would be a saving of no less than 41 per cent. in favour of the electrical scheme.

At half-vessel speed one of the alternators would be closed down altogether, as only about 600 shaft H.P. would be required, and reckoning upon the lower efficiency of the motors and generators on this load, the output would be 740 KW., and the steam consumption would be 24 lb. per KW.-hour. This would correspond with an actual steam consumption of 17,760 lb. per hour. Direct-coupled turbines running at half speed would take 47 lb. per shaft H.P., or 28,200 lb., so that the electrical transmission scheme would mean a saving of no less than 37 per cent. at half-vessel speed.

The weight of the motors, conductors, condenser, piping, pumps, &c., would be approximately 184 tons, whilst the weight of the direct-coupled turbines, propeller shaft, shaft tunnels, condensers, piping, &c., would be about 148 tons, the electrical equipment being thus about 25 per cent. heavier than the direct drive. Against this, however, the saving in weight on the boiler side of the stop valves would have to be considered. Reckoning 180 lb. weight per I.H.P. for boilers, mountings, funnel, feed pumps, piping, gratings and platforms, the total weight, reckoning 4,700 I.H.P., would be 377 tons. Reckoning 16 lb. of steam per I.H.P., including auxiliaries, losses due to radiation, &c., this gives us 75,200 lb. of steam per hour, or 200 lb. of steam per hour per ton of boiler equipment.

For the electrically-driven vessel the steam consumption would be in the order of 52,000 lb. of steam, so that the weight on the same basis as the above would be 260 tons, showing a saving of about 180 tons, or 40 per cent. in favour of the electric scheme.

As regards coal consumption, reckoning upon evaporation of 10 lb. of water per pound of coal burned, the consumption for the direct coupled turbine vessel would be 8,800 lb. per hour, and in the case of the electric vessel 5,200 lb., or a saving of 1·6 lb. per hour, or a saving of 230 tons in dead weight in a vessel running for six days.

The electrical system lends itself readily to the conversion of existing single propeller vessels, whilst in the case of twin screw vessels, economical advantage is gained by the use of one power generating plant operating the twin screws.

Energy Losses Between High-Voltage Conductors.*

A PAPER on "High-Voltage Measurements at Niagara" was presented by MR. RALPH D. MERSHON at the Atlantic City Convention of the American Institute of Electrical Engineers, on June 30th.

MR. MERSHON reported the results of investigations of the phenomena existing when transmission line conductors are subjected to high alternating voltages. The tests were made on two specially-constructed lines at Niagara Falls. One, having a total length of 2,000 ft., and known as the "experimental line," was supported on wooden poles, the line wires being suspended by means of paraffined cords so that the effect of "insulators" was eliminated. The second line, known as the "dummy," was built for the purpose of investigating the effect of the insulators. It consisted of many insulators situated on cross-arms, with the minimum permissible lengths of spans between them. As the result of his work at Telluride, the work of Prof. Ryan, and the tests at Niagara, the author stated that the following conclusions might be drawn:—

With a given conductor at a given spacing and under given atmospheric conditions, there is a certain voltage or "critical" point at which a very appreciable loss of energy begins to occur through the atmosphere.

The presence of floating particles or of moisture in the atmosphere may produce a loss below the critical point, and affects the value of the critical voltage.

The critical point corresponds to a partial breakdown of the dielectric, and coincides with the voltage at which luminosity or hissing (or both) of the conductors begins; it depends upon the maximum value of the electromotive force wave and the distance between the conductors, as well as upon the diameter of the conductors.

The loss over insulators in a fog is very much higher than the loss in dry air, and somewhat higher than that in a heavy rain.

The smoother the surface of the conductor, the less the loss and the higher the critical point. The stranding of the line conductors reduces the loss and raises the critical point due to the increase of the equivalent diameter of the conductor, which is greater the greater the number of strands.

The weathering of conductors does not appreciably increase the loss of energy or lower the critical point, which are the same for copper and aluminium under the same conditions.

The loss over an insulator on a wooden pin is greater than that over an insulator on a metal pin, because the resistance of the wooden pin is in series with the capacity of the insulator.

The atmospheric loss between conductors and the loss over insulators decreases with the frequency.

Neither the critical point nor the loss between cables is affected by variation in the distance of the cables from the ground.

Mr. Mershon stated that the tests recorded in his paper had been conducted on a single-phase circuit, and the results would probably be somewhat different on a three-phase system. He hoped to continue the investigations until electromotive forces as high as 300,000 volts had been reached.

* *Electrical World.*

LEGAL.

Right of Action at Common Law.

His Honour Judge Bray has given a written judgment in the action Turner *v.* London United Tramways Co., reported in our last issue.

His Honour stated that he had to consider whether, in the present case, the plaintiff had recovered compensation from his employers, and was therefore, by Sec. 6 of the Workmen's Compensation Act, 1906, precluded from recovering damages at common law. The defendants relied on a written receipt for money paid to plaintiff weekly by his employers, but the evidence of plaintiff himself and witnesses from his employers stated that he never meant to make any claim against his employers, and took payment such as the firm had been in the habit of paying their men in cases of accident or illness. He, moreover, stated there was an understanding between him and his employers that he would go against the tramway company as soon as he knew the extent of his damages. Taking those circumstances into consideration, and not confining himself solely to the receipt, he was of opinion that plaintiff had not recovered compensation from his employers, and that he had a good ground of action. He found in his favour for £24 damages.

Dumbill *v.* Manchester Corporation.

In this action, at the Manchester County Court on Monday, the plaintiff was Mrs. Louisa Ann Dumbill, Runcorn, who claimed £100 damages against the Manchester Corporation for injuries sustained in a collision between two electric cars in Gorton. The accident took place on January 4th, and was due to the two cars entering a single line simultaneously. The shock was such that the plaintiff was thrown from her seat on to the floor of the car in which she was riding, and she suffered from concussion of the brain and spine and other complaints. The Corporation had admitted liability for the accident and had paid £60 into Court. After hearing medical evidence, Judge Parry awarded the plaintiff £79 18s., of which he particularised £60 "as for the pain and suffering of which the plaintiff had undoubtedly been the victim."

Java.—A correspondent writing home to us says:—"With the exception of the electric light company at Batavia which failed, and was, I believe, taken over by the gas company, there are no stations worth mentioning in Java. This is a very discreditable state of affairs, as there is water-power in abundance which can be had for the asking."

THE COLLIERY EXHIBITION.

(*Concluded from page* 197.)

Messrs. The Wolf Safety Lamp Co., 37, York Place, Leeds, had an interesting exhibit of all kinds of safety and other lamps for mining and general industrial purposes. The safety lamps are provided with an internal

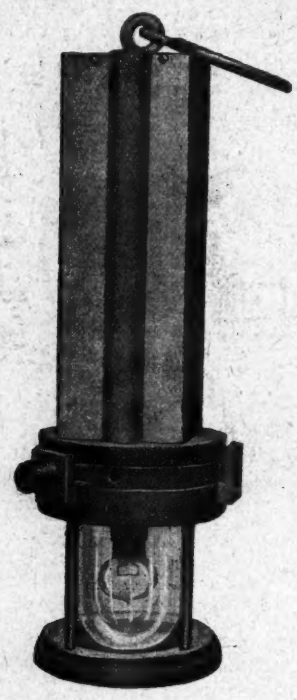


Fig. 14.—Bohre Safety Lamp.

igniter, so that any lamp may be re-lighted by means of a special key after being examined by a competent person.

Bohre's patent electric lamp was also exhibited. This apparatus is shown complete in fig. 14, and is supplied with the lamp either on the top or at the bottom. The accumulator consists of a single cell enclosed in a celluloid case, which fits loosely in the lamp body, and has a filling aperture, closed by a new three-chambered screw-closing device, which allows gases to escape but prevents acid flowing out. The glow lamp is a 2-volt Osmium lamp of 1 to 2 c.p., and is enclosed in a strong "well" glass, which is fixed "air-tight" to the case. Thus when the lamp is burning the pure air inside the well glass becomes heated and its pressure raised, so that should the globe become broken the heated air would drive back the outside air and fire-damp and rush into the lamp globe, causing the filaments to be rapidly destroyed before the explosive atmosphere of the mine could reach the light. The lamp weighs 4 lb., and will burn for 11 to 12 hours.

Messrs. Berry, Skinner & Co. also exhibited a new electric miner's lamp, which is lighted by means of a primary battery. The lamp consists of four parts, as shown in fig. 15—*i.e.*, the protected lamp cap, two cells and the battery case, upon the top of which the cap fits. The cells, we understand, are practically of the bichromate type, with some modification in the composing elements which prevents the formation of gas; the cells may therefore be hermetically sealed, and a charge may remain idle for an indefinite period without deterioration. There are no switches or wire connections, and to extinguish the lamp it is only necessary to invert it. The total weight of the lamp is about $3\frac{3}{4}$ lb., and it will burn for a period of 12 hours at a cost of threepence per 12 hours' light.

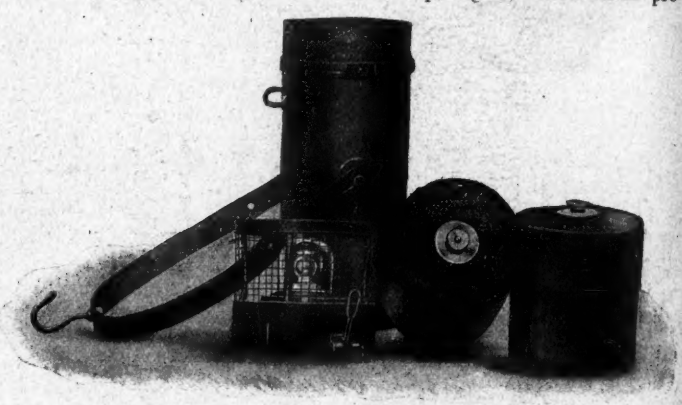


Fig. 15.—Berry, Skinner Miner's Lamp.

Messrs. Samuel Denison & Son, Ltd., Hunslet Foundry, Leeds, exhibited a new automatic mine truck or tub weighing-machine. In the ordinary way, the tub is run on to the weighbridge, and there brought to rest, while the man in the weigh-house takes the weight, and another man outside takes the "token" or "tally" number, and shouts it to the weighman, who books both weight and number. In order, however, to see "fair-play," the miners appoint another man, termed a check-weighman, to watch the other weighman, and ensure that the man who gets the coal receives the full measure of his labour. This new machine, then, is to remedy these defects in weighing, and to render the services of a weighman and a check-weighman

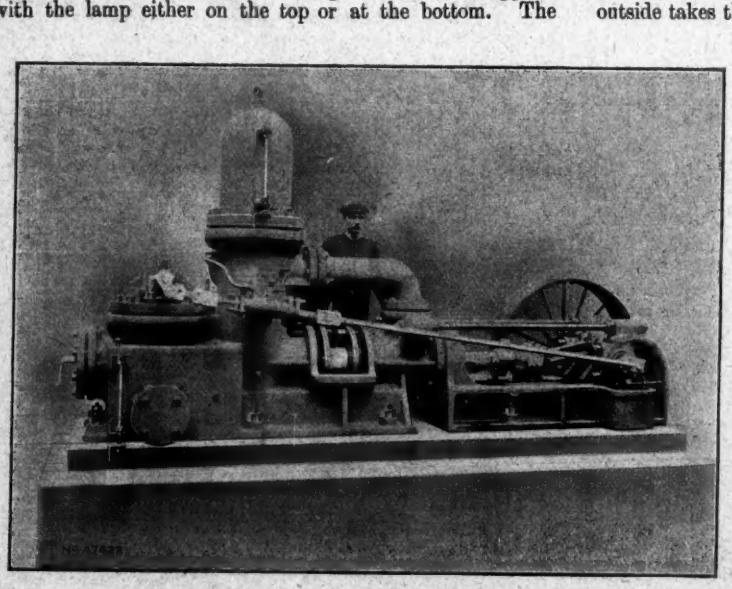


Fig. 16.—Oddie-Barclay Pump.

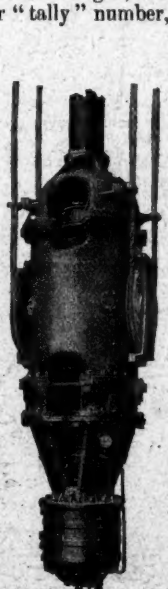


Fig. 17.—Turbine Sinking Pump.

unnecessary. It consists of the ordinary weigh-table and special machinery to give a record of both the miner's token number and the weight of the tub, which is automatically stamped or printed upon a tape which cannot be tampered with. When the miner descends in the morning, he takes with him a number of special tokens, with his number in bold relief. These are of brass, of a special shape, and fit into a small locking receptacle fitted on the outside of the tub. One of the tokens is placed in this, and is automatically locked; it can only be unlocked by means of a small electromagnet at the weighing machine. When the full tub arrives at the weigh, the man or boy in charge releases the token and places it in a special slot, when it starts the machine. The latter is driven by a small electromotor, and it is the miner's own token taken from the tub that starts the mechanism; the very shape of the number causes the correct printing number to come into position, and once in the machine, the token cannot be recovered for fraudulent purposes. No skill is required to use the machine, the weighing is entirely beyond outside control, and the record of the whole day's output is contained upon one continuous tape for reference. The Blake-Denison patent continuous weigher working with a belt conveyor 18 in. wide was also shown in operation. This machine records aggregate net weight in tons and tenths of tons.

Messrs. Andrew Barclay, Sons & Co., Ltd., Kilmarnock, exhibited one of their Oddie-Barclay pumps in motion, driven by an electromotor through belting. This is a high-speed pump with mechanically-controlled suction valves. The complete pump is shown in fig. 16, from which it will be seen that it is fitted with an air-charger for the air vessel, and that the suction valve is controlled by a tail rod on the ram of the air-charger, the whole being worked from a small crank on the main crankshaft. Very excellent results have been obtained from this pump, and as high as 90 per cent. efficiency has been attained in ordinary working. A new metallic packing was also shown, which has proved very satisfactory, merely consisting of rings of white metal which are rhomboidal in section. A further feature was a new mine fan, the novelty of which lies in the construction of the blades, which are formed like steps. The last few years have seen an almost entire departure from the usual construction of fan wheels, and probably the perfect fan has yet to be designed. Messrs. Barclay, however, have produced a fan, which, when driven through belting by a horizontal engine, gave an average combined efficiency of fan and engine for four tests of 70·2 per cent.

Messrs. John Davis & Sons (Derby), Ltd., exhibited an electric haulage, which is an excellent example of this class of machine. The starter is of the drum type; the first motion gearing is machine-cut, and the second motion accurately machine-moulded double-helical wheels, while the drums are fitted with post-type brakes.

Messrs. Scott & Mountain, Ltd., Close Works, Gateshead-on-Tyne, exhibited various electrically-driven mining pumps and haulage gears. Fig. 17 illustrates an electrically-driven turbine sinking pump, in which all the water is passed through the motor casing. The whole pump with the pipes is suspended by ropes in the shaft by means of the two pulleys as shown, and is raised and lowered as required. The firm also showed a good example of their haulage or winding gear, and a three-throw portable dip pump, with the motor driving through gearing.

Messrs. Dick, Kerr & Co., Ltd., Abchurch Yard, E.C., exhibited several of their direct-current and three-phase current motors, as well as their standard designs of crane motors, controllers, &c. A complete electric capstan was also shown, the principal feature of which was the contact type of starter, which is independent of the starting switch. After the circuit has been closed through the latter switch by depressing the foot pedal, the contacts of the former come automatically into operation, cutting out resistance and starting the motor in the usual way. On the release of the pedal, or the operation of the overload device, the reverse takes place, thus making it impossible for the attendant to start the motor too rapidly, and eliminating many starting-switch troubles due to carelessness in operating. Other items included oil switches, isolating switches, current transformers, circuit-breakers, auto-starters, &c., all designed to conform with the mining regulations.

Mr. Heinrich Lanz, 6, St. Bride Street, Ludgate Circus, E.C., exhibited the "Lanz" patent locomobile—or, as it is more generally termed in this country, "semi-portable"—power plant, which consists of a steam boiler with the engine fixed on the top. The boiler is fitted with a firebox and tubes, which are removable, and a superheater is located either above or below the tubes, as may be found the more convenient. These plants are now being made up to 1,000 H.P. It is claimed that the economy is very great, the coal consumption being only about 1 lb. per B.H.P. per hour.

Mr. Richard Sutcliffe, Horbury, Wakefield, exhibited examples of underground conveying machinery, the application of which will be better understood from fig. 18, showing

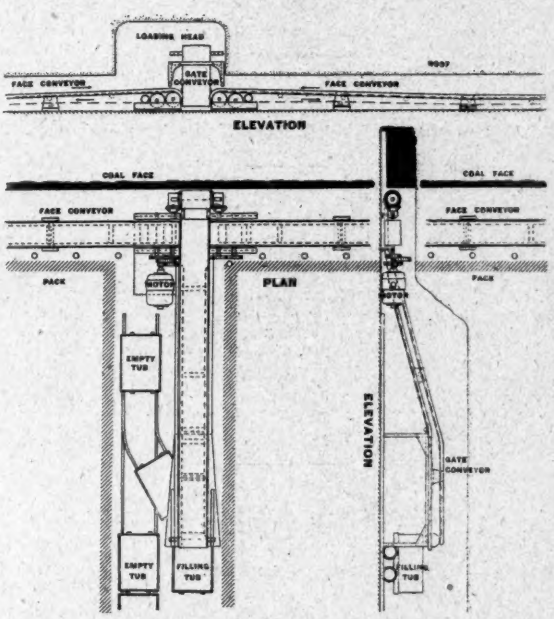


Fig. 18.—Underground Conveying Machinery.

the plan, and front and end elevations, respectively, of an electrically-driven system of working conveyors for receiving the coal at the "face" and delivering it into tubs in the "gateway." Mr. Sutcliffe has adopted a plain wire-woven belt, which works upon rollers in a low, light angle-bar frame. The belt is very strong, but at the same time flexible and light, and is close enough to prevent small coal passing through. The illustration shows two "face" conveyors, one on each side of the gateway, each delivering the coal on to the gateway cross-belt, which is elevated at the delivery end to allow of the coal-tub being placed underneath. There is no doubt but that this class of machinery will play an important part in the working of the thin seams of this country in the near future.

Messrs. The Hart Accumulator Co., Ltd., Stratford, London, had a fine exhibit of all kinds of storage batteries, the chief interest of which lay in the patent "Hexite" plate separators. Prolonged trials and severe tests have proved their efficiency in preventing short-circuiting, and they are applicable to any type of cell. They do not deteriorate, and do not affect the internal resistance or capacity of the cells, or impede the circulation of the electrolyte, being of a very porous nature.

A noticeable feature of the exhibition was the display of life-saving apparatus, considerable attention having lately been given by mining engineers and others to this matter owing to one or two very serious colliery disasters, which have resulted in the establishment of central depôts in colliery districts, for the purpose of storing equipment, and training men in the use of the apparatus. Three firms exhibited their special apparatus, and a smoke chamber was provided for demonstrations. One of the most interesting exhibits was Dräger's new electric head lamp, which is fitted to the helmet of the Dräger apparatus, and consists of a small special shaped accumulator attached to the back, with a 1-C.P.

lamp fitted to a bull's-eye case at the front. The great advantage of such a lamp is that it leaves the man's hands entirely free for dealing with obstacles, or other work, and he is further relieved of the danger of being left in the dark through his lamp falling and being broken or going out.

On the whole the exhibition was interesting, and there is no doubt but that such displays help along the car of progress: electricity each year takes a more prominent position in the mining industry, and gives rise to improvements in apparatus and methods which afford the means of a more rapid advancement, to the benefit not only of the miner, but also of the community at large. We can only hope that the exhibition has proved to be profitable to the promoter and exhibitors alike, as we have no doubt as to its usefulness.

ELECTRICAL ACCIDENTS IN 1907.

The following is an abstract of the report of the Electrical Inspector to the Home Office, Mr. G. S. Ram, for the year 1907:—At the end of 1907, the horse-power of the motors connected to the mains of electricity supply undertakings amounted to 357,000; as heretofore, the information is not complete, but a comparison of the figures available for both years shows an increase of 84,000 H.P., equal to about 32 per cent. for the year, as compared with 26 per cent. in the previous year. The figures do not include several of the electrical power companies, neither do they include factories where the current is generated on the premises.

TABLE I.—Accidents at Electrical Generating Stations and Sub-Stations, 1907.

Description.	Electricity Supply Companies and Local Authorities.		Private Stations.	
	Non-fatal.	Fatal.	Non-fatal.	Fatal.
Non-Electrical—				
At engines, pumps and generators	29	—	5	—
At boilers and steam plant	61	2	10	—
At coal-handling plant ...	17	—	2	—
Falls	53	4	3	1
Struck by falling bodies ...	29	—	3	—
Miscellaneous	57	1	5	—
	246	7	28	1
Electrical—				
At switchboards, when engaged in ordinary routine work; mostly due to faulty design of apparatus	10	—	1	—
Cleaning, repairing, &c., at "live" switchboards ...	13	1	3	—
Cleaning, repairing, or other handling of switchboards supposed to have been made "dead":—				
(a) Skilled persons ...	1	—	—	—
(b) Unskilled persons	—	—	—	—
Adjusting brushes... ...	9	—	2	—
Miscellaneous	15	1*	2	1
	48	2	8	1

* Suicide.

Of the electrical accidents under the first heading, three were due to mistakes on the part of the switchman. One was due to the failure of a large oil-type fuse, whereby the oil was ignited and severely burnt the arms and face of the attendant.

Under the second heading, the fatal accident occurred in an extra-high-pressure sub-station (11,000 volts) to a boy, who had been told to grease two switches which had been made "dead." Having done this work, it is supposed that he turned his attention to the next switch, which was "live," with the result that he was killed. Several other accidents of this kind occurred, and again emphasise the danger of switchboards not being arranged so that they can be made "dead" in sections, when work upon them becomes necessary.

One accident from shock occurred to a man when cleaning inside a steam boiler, and was due to a leaky hand-lamp supplied with continuous current.

TABLE II.—Reported Electrical Accidents in Factories, Engineering Works, &c., other than Electrical Generating Stations and Sub-Stations, 1907.

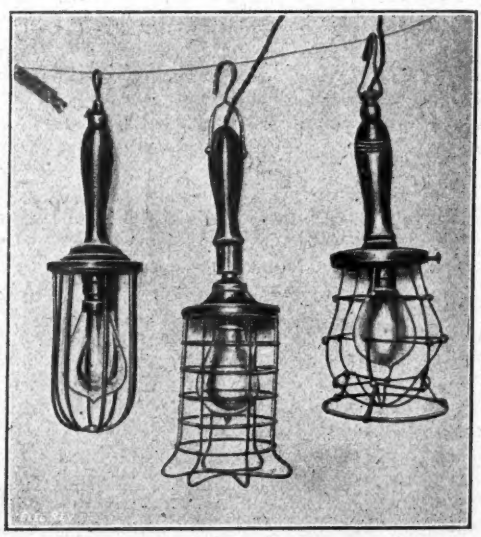
Description.	Non-fatal.	Fatal.
Arcing of { switches	17	—
Arcing of { fuses	26	—
Arcing at fuses, when replacing fuse wires ...	24	—
Unprotected conductors, switches, terminals, fuses, &c.	29	3
Faulty apparatus (other than switches)	55	2
Working on live conductors: { Skilled persons ...	24	—
Working on live conductors: { Unskilled persons	20	1*
Flashing at motor brushes when adjusting ...	3	—
Electric travelling cranes: { Unprotected electrical apparatus in driving-cage ...	6	—
Electric travelling cranes: { Faulty apparatus	8	—
Electric travelling cranes: { Carelessness	7	—
Miscellaneous accidents in testing electrical apparatus in course of manufacture	23	1
Miscellaneous...	16	1†
	258	8

* Fall following shock. † Due to a practical joke.

The number of accidents under this Table again shows an increase over the previous year, probably due to the extended use of electrical energy in factories. There is little if anything new in the circumstances of the accidents.

One was due to the absence of any protection on a three-phase, medium-pressure motor-starting switch. The switch was in a works, and not in a motor room or a switch room accessible only to authorised persons. Owing to the nature of the industry the floor at the switch would always be wet; there would therefore always be the risk of a fatal accident to anyone touching a "live" part of the switch. The installation was put in and the power supplied by an authorised undertaking, subject to Board of Trade regulations, under which the switch should have been so enclosed and protected as to prevent danger of shock in the ordinary handling. This regulation had, however, been entirely ignored. The arrangement was little better than a trap, even for an authorised person.

Another fatality shows the necessity for properly protecting insulated wires in engineering works where they are liable to damage. The insulation of a conductor was cut through by the edge of a piece of iron which a man was carrying. Although the pressure was only 250 volts, alternating current, the man was



A. B. C.

Fig. 1.—Three Hand-Lamps which have caused Fatal Accidents.

killed. Another fatality was due to a man touching with an iron rod the frame of an arc lamp working at high pressure, the frame of the lamp forming part of the circuit.

A man was engaged at a saw bench where hot metal was being cut up by a circular saw, driven directly by a three-phase motor working at 350 volts per phase and, therefore, probably only 200 volts above earth. Immediately the switch was pulled off, the man at the saw received a shock and was killed. The saw bench had become electrically charged through a trifling breakage at the switch. The cover of the switch was connected to a bolt forced against a metal column of the building, but the earth connection proved useless, probably because the bolt had not penetrated the coating of paint on the column. It is, however, a question whether

earthing to a column of a steel frame building is in any case sufficient. I have known of the framework of a large shop elsewhere becoming electrically charged by a similar trifling accident and persons receiving shocks therefrom.

The case of the practical joke again emphasises the danger of alternating current of low voltage, 200 volts. A wire was connected from a wall plug to a door handle. The victim took hold of the handle and received a fatal shock.

Another fatality was due to a faulty hand lamp. The metal work of the lamp, including the wire guard to the lamp, became live. The man was in connection with earth and received a shock. He could not let go of the lamp and was killed. The pressure was 250 volts alternating current. I have described precisely similar accidents in previous reports. Another one occurred during the year at 215 volts alternating pressure, but not on premises under the Factory Act.

The danger in the use of hand lamps as ordinarily constructed is seldom realised, and can so easily be guarded against that I propose to refer to the matter at greater length. The danger arises from the construction of the lamp being such that any metal work used is very liable to become electrically charged. If, therefore, a person holding such a lamp happens to be standing on metal floor plates or on damp ground or is otherwise in connection with earth, he may get a shock, and in all probability he will be unable to release his hold of the lamp and a fatal result will ensue. The accompanying illustration, fig. 1, shows three hand lamps, each of a different pattern and each of which has been the cause of the death of a man, under the circumstances indicated above. In each case the current was alternating and low pressure. Each lamp has an insulating handle, but this has not prevented a fatal accident. The lamps A and C have each a brass tube passing through the handle. One end of the brass tube is screwed into the lampholder and the other end into a ferrule which serves to hold the insulating handle in position and provides an attachment for the metal hook, by means of which the lamp may be hung up. In each of these lamps if there occurs any defect by which any part of the metal-work makes contact with the conductors, the whole of the metal-work will become live. Although a person may be grasping the wood handle in the proper way, he is liable to touch the brass ferrule at one end or the gallery of the protecting cage at the other. If he is at the same time standing on "earth," he will get a shock which may prevent him dropping the lamp; in fact he will probably grasp it all the tighter, although the actual point of contact between his hand and the charged metal at one end or other of the handle may be very small. Lamp B is similar, but has no brass tube passing through the handle. The handle, however, is not large, and a man holding it is liable to have his thumb upon the brass socket into which the handle fits. This socket terminates in a short brass tube, which screws into the lampholder, and is consequently in metallic connection with the lampholder, the gallery and cage. Should

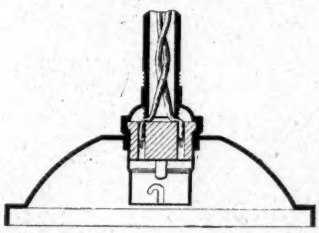


Fig. 2.—Defective Attachment of Lamp-Holder.

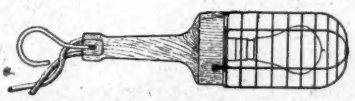


Fig. 3.—Safe Pattern of Hand-Lamp.

these parts become live through any defect, the person holding the lamp may again be unable to release his hold. In the case of each of these lamps the metal work became live when the persons holding them were in connection with earth, and were consequently unable to let go and were killed. Examination of the lamps showed the following defects, by reason of which the metal parts became "live." In lamp A the flexible wires pass from the lampholder through the brass tube inside the handle and out at a hole in the side of the brass ferrule. The edge of this hole is bushed with insulating material, but the edge of the end of the brass tube inside the ferrule is not so bushed and has a sharp edge. The insulating covering to the flexible wires appears to have been cut through at this point, thus causing the whole of the metal work to become "live," and hence the accident. In the case of lamp C, the flexible wires pass out through the end of the brass ferrule, and this, of course, is again a weak spot, the covering of the wires being liable to be injured at this point. This, however, does not appear to have been the cause of the metal work becoming "live" in this case. There is another defect, which I have indicated in fig. 2. The lampholder is screwed on to the end of the brass tube which passes through the handle, the flexible wires passing through this brass tube to the terminals fixed in the porcelain block in the holder. The fit of the threads in the holder and the brass tube is very easy, and the holder cannot be firmly fixed unless it is screwed on the brass tube, or rather the brass tube is screwed into the holder, as far as it will go. This, until the flexible wires are in position, means that the brass tube is screwed in so far that it becomes jammed against the porcelain block. The holes in the porcelain block into which the ends of the flexible wires are threaded are somewhat wider apart than the diameter of the brass tube. Consequently when the flexible wires are put in place, the brass tube is screwed hard up against them, nipping them between its sharp edge and the porcelain block. As there is no grip upon the flexible wires elsewhere within the handle, and as the lamp may be frequently carried about by means of the wires, the whole weight will be taken by the latter at the point where they are nipped. Under such conditions it is practically a foregone conclusion that the insulation, even if it should escape damage in the first instance, will be cut through after the lamp has been in use for a short time. In the case of lamp B the same defect occurs, although it appears that it may have been considered in the original design, the brass tube being only a short one fitted into the end of the brass socket into which the handle fits, this socket forming a shoulder against which the lampholder can be tightly screwed. The brass tube, however, is just too long, and before the holder can actually be screwed hard up against the shoulder the end of the brass tube is already cutting into the wires against the porcelain in the lampholder. These may appear very trifling defects, but it is nevertheless upon such that the life of the man using the lamp may depend. There is no difficulty whatever in constructing a lamp which should be free from these defects, and under ordinary circumstances absolutely safe.

The two most important points to be borne in mind in the design of a lamp for use in dangerous places—*i.e.*, where the user is in connection with earth—are (1) that there shall be no metallic connection between the lampholder and any other metal part of the fitting, and (2) that the flexible wires in passing from the lampholder shall not be taken through a metal tube or be otherwise touching any metal part of the fitting. Fig. 3 shows a very simple and inexpensive type of lamp, of which a number are in use, and which is very much safer than any of those shown in fig. 1. The body is made from a piece of oak, about 3½ in. in diameter at one end and turned down to form a handle. The flexible wires pass through a hole down the centre to the lampholder and are clamped near the end of the handle, so that no strain can be put upon the connection in the lampholder, which is of the "batten" type, and is screwed to the flat disk end. The wire cage is attached by screws to the outside of the disk. There is no metallic connection between the lampholder and the wire cage, and there is no other metal used in the construction of the fitting except the hook at the end of the handle, used for the purpose of hanging up the lamp. This hook should, however, be replaced by a leather or other non-metallic loop, as with constant use it might injure the insulating covering of the flexible wires where it rubs against them just beyond the end of the handle. With this slight alteration this lamp would be entirely free from the defects described in reference to those shown in fig. 1, and would probably be cheaper. As a result of my remarks on this subject in my last report, a lamp has been brought out in which the body is of wood. The lampholder, which is of the "cord-grip" type, is fixed in a vulcanite ring or cylinder, which is extended so as to form a guard or sheath completely surrounding it. The wire cage is attached to a metal ring which is screwed to the outside of the wood base. There is no possibility of any metallic contact between the cage and the lampholder. The lampholder is supported in such a way as to give a large insulating surface between it and the metal cage-ring, in view of preventing leakage by a film of moisture if the lamp is used in a damp situation. The only weak spot appears to be in the metal hook, which, however, can, without any difficulty, be replaced by a leather or other non-conducting loop.

In the course of my inspections during the year, I came across further examples of dangerous conditions of electrical plant:—

1. Switches designed so that the hand may touch live metal when grasping the handle.
2. Switches and fuses fixed to the same base in such a way that in switching on, the operator's knuckles will touch the bare fuse metal.
3. Oil cups, requiring frequent filling up, placed close to high-pressure brush gear on generators.
4. On main switchboard of authorised undertaking, main fuses fixed at back of board behind bus-bars.
5. Extra-high-pressure rubber-covered cables, not otherwise protected, fixed in generating station basement amongst steam and exhaust pipes and in the way of making joints in the same.
6. Switches for alternating current, medium pressure, in factories without any protection, in some places over wet floors.
7. Earth wires of motors, &c., connected to gas pipes.
8. Motor switches in factories fixed behind running belts.
9. Iron floor-plates behind switchboards having bare conductors.
10. Extra-high-pressure coils of generators and motors unguarded.
11. Medium-pressure switchboards placed one behind the other, with bare metal on both sides of the narrow working space.
12. High-pressure alternators with no protection at high-pressure collectors and terminals where likely to be accidentally touched.
13. High-pressure and medium-pressure switchboards with insecure floor at back.
14. Extra-high-pressure isolating switches, worked by attendant from a ladder in a dangerous position instead of by a pole from the floor-level.
15. Extra-high-pressure switchboard passage-way only 16 in. wide, having live metal exposed.
16. High-pressure sub-station fitted up in a dangerous manner "temporarily" on emergency, still in same condition after four years.

I found in one case a stop-valve which was worked twice a day

by a man standing on the steam pipe and having only the valve wheel to hold on by, with a drop of 25 ft. over the feed pump below.

On premises not under the Factory Act, in one case a labourer was killed in an extra-high-pressure switch chamber. All the conductors had been made dead for cleaning, with the exception of some which he was instructed not to touch. No divisions or screens were provided to shut off or even to indicate the dangerous conductors. As in several previous accidents elsewhere in similar circumstances, the man went on cleaning until he came to the live conductors and was killed.

TABLE III.—Electrical Fatalities reported under the Factory Act, 1907.

Month.	Place.	Voltage of system.	Probable voltage of shock.	System. A = alternating, C = continuous, 1 = single-phase, 2 = two-phase, &c.
January	Ravensthorpe	400	—	A 3.
February*	Jarrow-on-Tyne	440	—	A 3.
April	Middlesbrough	250	250	A 2.
April	Manchester	440	—	A 3.
May	Sheffield	200	200	A 1.
June	Birmingham	1,000	—	C.
July	Middlesbrough	11,000	—	A 3.
September	Wednesbury	350	200	A 3.
October	Blaydon	250	250	A.
October†	Kingston-on-Thames	2,000	2,000	A 1.

* Fall following shock. † Suicide.

So far as my information is complete, there were during last year nine electrical fatalities in mines, seven in connection with electric railways and tramways, and one on the premises of a consumer of an authorised electric supply undertaking, the latter being a hand-lamp accident at 215 volts alternating pressure

As I have remarked in former reports, the danger of electric shock at low pressures is often not realised. A summary of the tables given in my reports for the six years from 1902, shows that there have been three fatalities from continuous current and 22 from alternating current at 250 volts or less, and 11 in addition from three-phase systems not exceeding 440 volts per phase, where the shock being to earth probably did not exceed 250 volts, and in some cases was less than 200 volts. Of these 36 fatalities, 24 were on premises under the Factory Act.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

15,898. "Improvements in controlling electrical transmission apparatus." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) July 27th. (Complete.)

15,902. "Process of preparing aluminium for plating and colouring and of plating, colouring and bronzing same." W. A. Thoms and H. C. Mossop. July 27th.

15,929. "Improvements in or connected with wireless telegraphy." V. R. Brandon. July 27th.

15,936. "Improvements in automatic switches." W. J. Davy. July 27th.

15,940. "System of telegraphy." R. L. Dean. July 27th. (Complete.)

15,941. "Improvements in apparatus for testing magnetic qualities of metal." British Thomson-Houston Co., Ltd., and A. J. Martin. July 27th.

15,949. "Improvements in or relating to make and break devices." T. J. Rorke and E. Rorke. (Date applied for under Rule 13, January 3rd, 1908. An invention comprised in application No. 12,967, dated June 4th, 1907.) July 27th. (Complete.)

15,562. "Electro-chemical process for cleaning and polishing silver, plate and the like." A. M. Kohler. July 27th.

15,966. "Improved cable connector and emergency break for use with portable and other electrical machines particularly adaptable to mining electrical work." H. Willis. July 28th.

15,979. "Improvements in or relating to electric lamps." Van Raden & Co., Ltd., and M. Metz. July 28th.

15,994. "Improvements in shade devices for electric lamps." C. W. Frauenlob. July 28th. (Complete.)

16,028. "Improvements in appliances for use with telephone transmitters." E. F. Hutton. July 28th. (Complete.)

16,029. "Improvements in telephone apparatus." A. M. Cobb. July 28th. (Complete.)

16,045. "Improvements in terminals for electric batteries." H. W. Butler. July 28th.

16,060. "Improvements in, or in and relating to means of connection between electrical conductors." E. Rayner and The Chillington Tool Co., Ltd. July 29th.

16,076. "Improvements in automatic trolley controlling devices for use on electric tramcars and the like." J. R. Willey and F. Worsley. July 29th. (Complete.)

16,084. "Improved means for producing at a distance, copies of drawings, photographs, writings and the like." J. J. Waddington. July 29th.

16,096. "Improvements in telephone installations." Siemens & Halske Act-Ges. (Date applied for under Sec. 91 of the Act, August 2nd, 1907, being date of application in Germany.) July 29th. (Complete.)

16,126. "Improvements in starting switches for electric motors." E. Garside. July 29th.

16,136. "Shield for the use of linemen." G. E. Harrison and G. Burns. (Date applied for under Sec. 91 of the Act, August 1st, 1907, being date of application in United States.) July 29th. (Complete.)

16,144. "Improvements in individual electric driving of spinning and twisting frames and machines." J. and T. M. Greeves, Ltd., and R. V. Eves. July 30th.

16,151. "Improvements in electric arc lamps." The Jandus Arc Lamp and Electric Co., Ltd., and A. D. Jones. July 30th.

16,164. "Improvements in spring switches for electrically setting railway points and signals." Siemens & Halske Akt-Ges. (Date applied for under Sec. 91 of the Act, September 2nd, 1907, being date of application in Germany.) July 30th. (Complete.)

16,170. "Improvements in primary batteries." E. E. Rouse. July 30th.

16,183. "Improvements in or relating to telephony and telegraphy." J. Schiessler. July 30th. (Complete.)

16,208. "Improvements in electric current transformers." Siemens Bros. and Co., Ltd. (Siemens & Halske, Aktiengesellschaft, Germany.) July 30th. (Complete.)

16,216. "Improvements in telephonic apparatus." H. W. Hellmann. July 30th.

16,272. "Improvements in apparatus for reproducing at a distance pictures or designs." E. Belin. (Application for Patent of Addition to No. 1,615/1908.) July 31st. (Complete.)

16,285. "Device for automatically switching in an auxiliary source of electric current on failure of the main supply." The Chloride Electrical Storage Co., Ltd., and A. Imbery. July 31st.

16,298. "Improvements in and relating to electro-magnetically operated switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) July 31st.

16,299. "Improvements in electric voltage regulators." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) July 31st.

16,305. "Improvements in supports for contact plows or electric current collectors for electric railways." M. E. Curwen. (J. G. Brill Co., United States.) August 1st.

16,311. "Improvements in connection with electric lampholders." F. W. Russell. August 1st.

16,366. "Improved method of regulating resistances of electric motors and apparatus for the same." M. T. Medway. August 1st.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Electrically-Driven Pulley Blocks or Hoists. A. A. C. Gese. 15,363. July 3rd.

Process for the Manufacture of Illuminating Bodies for Electric Incandescence Lamps. Deutsche Gasgluhlicht Akt.-Ges. 15,510. July 5th. (Date applied for under International Convention, July 11th, 1906.)

Electrical Apparatus for Operating Winches. T. P. Pollitt. 15,922. July 11th.

Current-Collecting Devices for Dynamo-Electric Machines. M. Walker. 19,010. August 23rd.

Electrical Self-Controlling Pendulum. W. C. Steljes. 20,061. September 9th.

Filling Joint Boxes to Protect the Joints of Electric Cables. E. A. Claremont. 20,639. September 17th.

Electric Arc Lamps. A. D. Jones. 24,138. November 1st.

Refractory Electric Conductors. British Thomson-Houston Co. (General Electric Co., United States.) 24,707. November 7th.

Brake-Operating Mechanism of Electric Lifts or Hoists or the like. Felten & Guilleaume Lahmeyerwerke Akt.-Ges. 25,987. November 23rd. (Date applied for under International Convention, November 24th, 1906.)

Methods of and Devices for Protecting Electrical Systems and Apparatus. E. E. F. Creighton. 26,642. December 2nd. (Date applied for under International Convention, February 23rd, 1907.)

Incandescent Electric Lamps. E. C. R. Marks. (Parker-Clark Electric Co.) 27,809. December 17th.

Electric Railway Installations. E. Woltmann. 27,989. December 19th.

Method and Means for Controlling Electric Motors. H. W. Leonard. 8,079. April 6th.

Switch for Controlling Electrical Circuits. T. J. Rorke and E. Rorke. 12,967. June 4th.

Controlling System for Electric Railways. W. Arthur. 13,206. June 6th.

Systems for Controlling Electrical Devices. W. E. Ebert. 15,624. July 8th.

Receiving Instruments for Electric Telegraphy. R. H. Edgar. 15,789. July 9th.

Electric Incandescence Lamp with U- or V-shaped Supported Metal Filaments. H. Kuzel. 15,798. July 9th. (Date applied for under International Convention, May 31st, 1907.)

Mould for Casting Electric Accumulator Grids. W. Fennell and W. P. Perry. 15,880. July 10th.

Construction of a Pocket Electric Lamp worked with Secondary Battery, Applicable for Various Purposes. W. Thomson. 16,034. July 12th.

Electrically-Operated Cloth-Cutting Machines. R. P. J. Willis (E. M. Waring, U.S.) 16,073. July 12th.

Means for Attaching Flexible Conductors to Commutator Brushes, and also Applicable for Uniting Other Bodies or Articles. Morgan Crucible Co. and C. D. McCourt. 16,175. July 13th.

Incandescence Electric Lamps. C. H. Stearn and C. F. Topham. 16,431. July 17th.

Making Electrically-Conducting Joints in Metallic-Filament Incandescent Electric Lamps. A. C. Hyde. 17,817. August 6th.

1908.

Vacuum Drying and Impregnating Apparatus for Electric Cables. E. Passburg. 3,507. February 15th.

Regulating Device for Electrically-Driven Fluid Compressors. C. H. Scott. 5,107. March 6th. (Application for Patent of Addition to No. 21,031/07.)

Electrical Current Meters. Siemens & Halske Akt.-Ges. 6,895. March 28th. (Date applied for under International Convention, March 28th, 1907.)

Method of Testing Electrolytic Valve Cells or the like. Siemens and Halske Akt.-Ges. 7,480. April 4th. (Date applied for under International Convention, April 4th, 1907.)

Dynamo-Electric Machines also Applicable as Rotary Electric Transformers or Motor-Generators. Crompton & Co., J. C. Macfarlane and H. Burge. 8,065. April 11th.

Electric Signalling Systems for Railroads and the like. A. J. Boult. (Union Switch and Signal Co., U.S.) 9,849. May 6th.